

A PHILOSOPHICAL
T R E A T I S E
O F
HUSBANDRY and GARDENING:
B E I N G A

New METHOD of Cultivating and Increasing all
sorts of TREES, SHRUBS, and FLOWERS.

A

Very CURIOUS WORK: Containing many Useful SECRETS in
NATURE, for helping the Vegetation of TREES and
PLANTS, and for fertilizing the most Stubborn Soils.

By G. A. AGRICOLA, M. D.
and Doctor in Philosophy at Ratisbonne.

Translated from the High-Dutch, with Remarks: and Adorn'd with CUTS.

The whole Revised and Compared with the Original, together with
a PREFACE, confirming this New Method,

By RICHARD BRADLEY,
Fellow of the Royal Society.

L O N D O N:

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To the Right Honourable the

E A R L of P E M B R O K E,

*Knight of the Most Noble Order of the Garter, and
Member of the Royal Society, and of the Royal
Academy of Paris.*

My LORD,



O U R Lordship's Curiosity in useful Learning engages me to address this Piece of Dr. *Agricola's* to You; and as the World is sensible Your Lordship is of too sublime a Judgment to receive any thing which does not carry Truth with it, I have been careful to make several of the Experiments mention'd by the Author; from whence I find my former Opinion to be enforced, that the Study of Nature is vastly extensive, its Consequences beneficial and pleasant in its boundless Searches.

DEDICATION.

The Truth which a Natural Historian ought to possess, can want no Encouragement, while Your Lordship continues to communicate so generously Your Observations, and the Curiosities which adorn Your *Excellent Collection*, from whence Men may gain the Judgment of distinguishing between Originals and Copies, or Realities and Falsities.

This Method, which Your Lordship so generously practises, is certainly the surest way of introducing such Knowledge as is truly useful; for where we have Nature and Experience for our BASIS, our Reason is certainly more Solid and Binding; and as Mathematical Demonstration is no more than an Explanation of the Laws of Nature, so whatever is not Conformable to those must be Erroneous.

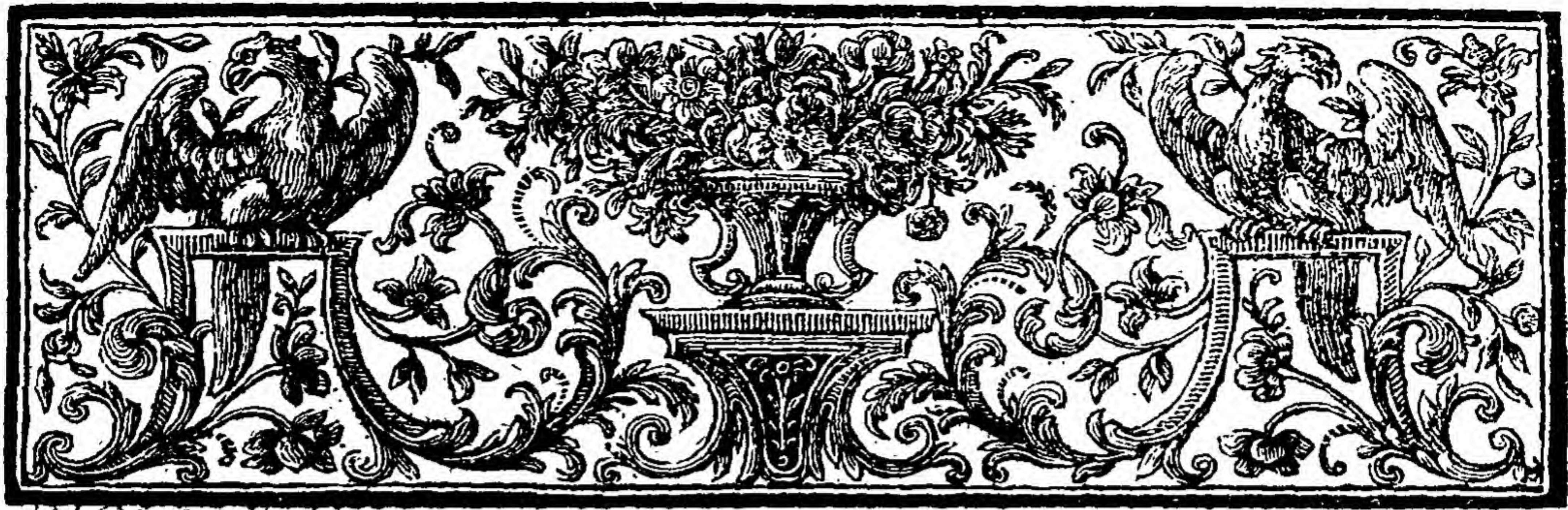
That Your Lordship may long remain an Example of generous Learning, and a Patron of Knowledge, is the hearty Wish of,

My LORD,

Your LORDSHIP'S

Most obedient humble Servant,

Richard Bradley.



T H E P R E F A C E.



I S now about four Years since I first met with a Book publish'd by Dr. Agricola, relating to the Universal Increase of Trees, by means of Fire and Vegetable Mummy; the publishing of that Piece made such a Noise then in the World, that many of our English Noblemen and Gentlemen employ'd me to purchase the Secret, imagining, that besides the easy Method of Multiplying and Increasing Trees (proposed by the Doctor) that he had also a Secret for promoting the Growth of Plants, with that surprising Quickness, that a Tree cultivated after his manner, would grow above twenty times as fast as it would do if it was order'd in the common way; and indeed that Book seem'd to intimate as much; but upon Enquiry, I found that Dr. Agricola contented himself only with such Measures as would direct the planting of Trees, and raising great Numbers
of

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of them from their several Parts; and his Method was then new enough to raise many Admirers, but we yet wanted the Directions to perform it.

We have waited a long time with Impatience for this useful way of Improving and Multiplying Trees, which at length Dr. Agricola has been generous enough to publish to the World under the foregoing Title; which Work has been so well received in Germany, that the Hollanders and French have thought it worthy translating into their Languages, so that there is no need of Apology for its appearing now in English; and I have the Pleasure to say, it contains as much useful Matter as any Book that has been publish'd upon the same Subject. The Author indeed seems to have given his Thoughts in some haste, and is a little difficult in some part of his Work; but we may excuse him, as long as his Scheme is new and generally useful.

It consists chiefly of Rules for Multiplying of Trees from all their Parts, as Roots, Stem, Branches, Twigs, and even from the very Leaves, which he prepares in such a manner with Vegetable Wax or Mummy, as he calls it, that every Bit of a Tree ordered in his way, will take Root, and grow, almost at any time of the Year.

*I have my self tried some of his Experiments, and find them to answer beyond my Expectation, tho' I had all the Disadvantage of Weather for my Purpose. The 12th of July I cut several Branches of this Year's Shoot from Peach-trees, Pears, Plums, Arbutus, Vines, Bays, Hollies, Yews and Elms, and having reduced them to the Length of about six Inches each, I dipt each end of them in Vegetable Mummy, as he directs; the Weather was then very hot and scorching, and the Ground exceeding dry. I had a Bed dug up of common Soil, inclining to Sand; after having press'd down the Earth as close as I could, I planted the prepared Cuttings about four Inches deep in the Ground, and
ram'd*

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*ram'd the Earth close about them; at the same time likewise, I planted some in the revers'd Way, prepared with Mummy as the others; and that I might omit none of his Experiments which I had then an Opportunity of making, I prepared and planted some young Plumb-Trees with their Roots in the Air; and likewise some Roots of Trees that had neither Twig nor Bud upon them; and for the better Experiencing the Author's Directions, I prepared and planted the Leaves of Oranges, Laurel, Holley and Bay, watering the whole Plantation so plentifully, that the Ground became like Paste. I had a mind to try at the same time the use of Soap, which I had heard was very helpful to Vegetation; for that end I took the Cuttings of Vines, Yew, Pear, Plum and Bay, and Soap'd the Parts which were to be in the Earth, of a good thickness, these I planted and water'd like the former, and left them exposed to the Air and Sun ever since. Of the Vines dress'd with Mummy, I have two thirds alive, but the Leaves dropt; the Pears and Arbutus are all in a promising Condition, as well as the Plums, but their Leaves scorck'd; the Twigs of the Peach-Tree remain fresh and green; one half of the Yews are dead; the Bays are all alive, but look sickly; and the Elm-Cuttings, though they have lost their Leaves, promise well enough; the single Roots and their Cuttings, as well as the Plants which I set the reversed Way, are all alive; and one of the Cuttings of the Plum-Tree has already sprouted an Inch * out of the hard Wood. About the End of October (by Accident) the Bed where these were planted was dug up, and I then found the Vine-Cuttings had taken Root, and some others had a callous Matter prepared to push into Roots, as also had some of the Bay-Leaves, whose Tops remain'd very green and perfect; and some of the Vines which were Soap'd, had made Shoots of three Inches in*

* September 10.

length;

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length; from hence I suppose, if I had made this Plantation earlier in the Summer, I should have got Plants that would have born Fruit much sooner than those raised from Cuttings the common way.

In fine, I have this to say of Dr. Agricola, that in this Work he has given us a great many useful Thoughts, which Men of Judgment may Cultivate to private as well as publick Advantage.



PREFACE



PREFACE of the French Translator.



ALTHO' *Agriculture* is not allow'd to be the most necessary of all Arts, it is nevertheless a Subject worthy the Attention of the wisest Men. When the Almighty chastised the first Man for his Offence, in eating the forbidden *Fruit*, he yet preserv'd so much TENDERNESS for him, that he made his Labour necessary to him, and his Practice of *Agriculture* a Resource against his Misery. 'Tis too much Luxury and Pride which has render'd *Agriculture* a despicable Calling; and has made some sort of Men suppose it a Trade only worthy such of the Sons of *Adam* as were good for nothing else, and whose Poverty could only make them undergo the Hardships of it.

But this was not the Idea which the true *Roman* Spirit had of *Agriculture*; those Warriours, at their Return from Battle, from taking of Towns, and subduing of Nations, were impatient to cultivate their Lands, and thought it no Disgrace to follow the Plough, and at the same time were prepared to serve the Wants of the State, and attend the Councils, or put themselves at the Head of Armies. The Natural Historian tells us, that in those Days the Earth bore Testimony, by the Richness of its Burden, how much it rejoyced in the Honour of being cultivated by Hero Labourers, and dug up by a Spade crown'd with Laurels. *Gaudente Terra vomere laureato, & Triumphali aratore.* Plin. Hist. Nat. XVIII. 3.

PREFACE of the French Translator.

But I do not propose this as an Example for every one to follow; the Manners of Men are too much changed, and our Senses too refined, to receive the Austerity so much esteem'd by the first *Romans*; I only wish, that the World may conclude with me, that the Study of *Agriculture* is not unworthy the greatest Men, leaving the most painful Part of that Profession to the profess'd *Gardeners* and their Labourers; for may not the Learned at least contribute to their Work, in reflecting for them upon the Uniformity of Nature in the Productions of its Works, and in assisting those Workmen towards perfecting an Art, which is yet so little understood? Yes certainly: And such as can furnish just Remarks, and such Observations as are useful to the Publick, are Praise-worthy.

Gardeners being only guided by Experience, are seldom led to make any Reflection upon the Principles of their Art; the Knowledge they have is for the most part Historical, and is wide from the Cause of what they see: They sow Grain in the Earth, and when it is reap'd and carried away, they know the Ground must rest, or be amended by some sort of Manure. The *Seed* grows, if the Ground is good; but how does it grow? and in what degree, or by what means, is this Vegetation produced? This would be too much to ask of them, and the very Question would be lost. They plant a *Tree*, as their Master did before them; but might it not grow better, if they were to follow some other Method? Would not Nature work with more Facility in her Operations, if by studying her Laws we were to take necessary Precautions to ease her in her Works? But their Studies are not of that Extent. They act agreeable to the Practice they have seen, and the old beaten Road they have been bred up in stands them in lieu of Reason.

On the other hand, *Philosophers* often want the Experience of the *Gardener*; many of them forge Systems in the Air, upon which they build abundance of specious Reasonings, but have
nothing

PREFACE of the French Translator.

nothing solid in them, because they are not founded upon the true Basis of natural Knowledge, which is Experience; it is therefore no Wonder if many of those speculative Systems fall into Mistakes. We may compare them to enchanted Castles founded upon Magick, which have nothing real in them, and vanish in Smoak, in the very instant when we should admire their Beauties.

But when we find a wise and a laborious Man, who joins Reason with Experience, we cannot fail of some happy Production from him, both useful, and in the Road of Truth, sooner than enjoy even one of these Agreeables, from one who has but one of these Excellencies. Dr. *Agricola*, who gives us this *Philosophical Treatise of Agriculture*, is one of those Philosophers, who is not led by frivolous Speculations into unfruitful Matters; his End is to supply the Defect in common *Gardeners* on the reasoning Side; his Thoughts are founded on his own Experience, which he has set forth in such a manner, that we almost see them executed; his Design is tending to improve Lands, to encrease and multiply *Plants*, and to assist Vegetation: His Book has been highly applauded in *Germany*; the *Holland* Translation of it has been equally admired; and Monsieur *de S. G.* who put it into *French*, thought it might prove as acceptable in that Language. When I had compared his Translation with the Original *German* Copy, I gave this Judgment of it.

There are two sorts of Readers, one of them makes a Translator answerable for every Fault, or whatever is not pleasing in the Book; they would have a Translator beautify and smooth the unpolish'd Turns and rude Expressions of his Original, and even to lend here and there such Expressions, as might better the Author either in his Phrase or Argument, and, in a word, to supply his Defects. But others, of a different Taste, require no more from a Translator than the Author's own Words, and to let him speak for himself; they would have the Translation of a

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Book like some Wines, which, how far soever they are transported from their Original, still preserve so much of their native Flavour, as to inform us of the very Spot they were derived from. They grieve that they cannot read an Author in his own Language, and at the same time delight in seeing him laid before them in all his Original Simplicity. We may easily discern that the *French* Translator apply'd himself chiefly to oblige this Set of Men, attach'd himself scrupulously to the Thoughts, and even to the very Words of the Original.

It would be an Injustice to expect that a Book of this Nature should be written in an Heroick manner; but as the Ladies sometimes supply a want of Beauty by a large Fortune; so we may say, that the Use of this Book may stand it instead of other Agreeables. The Publick would be a loser, if it was to be depriv'd of all the Books that were not written in an Heroick Stile.

Neither must the Reader be disgusted, if now and then he meets with a new Turn of Expression, such as *Oculation*, *Mummy*, *Incision*, &c. those Terms are explain'd either in the Work, or in the Remarks. I freely give my Advice, with regard to this Work, as a famous Mathematician has done before me, with relation to a Book of his own, which is, to read it throughout the first time without hesitating at small Matters, or such Passages as seem a little difficult; the second Reading will make it more familiar, and the Use less troublesome.

June 1, 1720.



The

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R E M A R K S

O F

Mr. B. L. M.



SOMETIME after the *French Translation* of this Work was finish'd, I had the Honour of seeing the Manuscript. The extreme Love I have ever had for *Gardening*, my Knowledge of the Language in which the Original is written, and the Singularity of Dr. *Agricola's* Style and Ideas, all contributed to make me desirous to see the Piece, which, when I had read over, I found that both the Author and the Translator had in some places need of an Explanation. This gave me Occasion for Remarks, some of which I wrote in the Margin of the Manuscript, and which the Reader has, without doubt, already seen in the Pages to which they belong. And Mr. S. G. the Translator, was desirous I should publish the rest at the End of his Volume. To do him a Pleasure therefore, I

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have

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have abandoned them to the Publick, as well as a Preface, which is to be found before the First Part, and which perhaps the Reader will find more to the Purpose, than that Rabble of Verses, Emblems, congratulatory Letters, Prefaces, Introductions, and Apologies, with which the *German* Edition is so stuffed. As to the Remarks, I am satisfied they will not be altogether unuseful to some Readers.

On the First Part.

Chap. 2. § 1. It may appear strange to some Persons, &c.] Dr. *Aglicola* being willing to give those *Plants* which he has chosen to be the Subjects of his Meditations, a certain Air of Dignity by the Similitude he makes between them and Man, pretends to find their Principle of Generation in an Egg. In this he alludes to the System of Philosophers, who affirm that all Animals, Man himself not excepted, proceed from an Egg. 'Tis therefore Anatomists call that little Knot, which they find in Women, *Ovarium*, it being in some measure like the Bunches of Eggs which are in Hens; for which Reason we need not wonder if he applies to *Trees* the Terms *Embryo*, *Fœtus*, *Placenta*, *Chorion*, *Amnion*, &c. which are properly made use of in speaking of the Formation of the human *Fœtus*; and, in order to carry this Comparison still further, he treats of the Birth of the *Tree*, its Life, Distempers, and Death, in the same Style. But I know not whether the Author, who, in some places, pretends to so much Piety, had not better have let this Question alone, Whether it be possible to effect a Resurrection of *Trees* from their Ashes, and if the Vegetative Soul may hope for a Place with the *Trees* in Paradise? I cannot find any Wit in these Questions, nor do they shew the Proposer to have too much of the Christian in him.

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Sect. 2. Chap. 3, p. 117. This Pot is like the little Earthen Pots for *Carnations*, with this difference, that this has a Hole at the bottom from the middle of the Pot to the side, thro' which the *Branch* is thrust, and set in Earth without dividing it from the *Stock*. *Gardeners* make use of this kind of Pot for young *Suckers*.

Sect. 3. Chap. 1. § 1. Dr. *Faustus* was a *German*, who had the Misfortune to be more learned than the Ignorance of the Age he liv'd in allow'd. The common People, surpris'd at some things he did by the means of natural Philosophy, very freely bestow'd the Name of Conjuror upon him; and at his Death gave out that the Devil had carried him away; as in our Days has been reported of a famous *French* General, not only by the Rascality, but even in printed Books. The *Germans*, above all People, are perswaded that *Faustus* was a great Magician, and they report abundance of Wonders of him. Such a Foundation is very easily built on. And their Strollers have made a Farce of the Fables related of him, which is always their Piece of Reserve when others fail, and perhaps has principally contributed to the keeping of the Story up. *Drexelius* tells us one in his *Auri fodina*, Pag. 146, as follows, ' *Faustus* having one Day invited
' some Friends to a Treat, they desir'd him to let 'em have a
' Differt of Grapes, not believing he could procure 'em, it being
' then the Depth of Winter; immediately a Vine sprung up on
' the Table, furnish'd with as many Bunches as there were Per-
' sons about it. *Faustus* forbid 'em to gather any of them, till he
' should give the Word; so every one holding his Knife in one
' Hand, and the Bunch that was next him in the other, stood
' waiting for the Signal. But how were they surpris'd, when,
' instead of the Word, on a sudden the Charm ceas'd, the *Vine*
' disappear'd, and, instead of *Grapes*, each found that he had
' hold of his own Nose, which he would have cut off, had he
' made any Attempt upon the *Vine* in Disobedience to the

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‘ Doctor’s Orders.’ There is no doubt but this is the Story the Author alludes to.

§ 2. Monsieur *Fontenelle*, in his *Dialogues of the Dead*, says very elegantly, ‘ All Sciences have their Chimera’s, after which ‘ we run without ever overtaking ’em; but which nevertheless are ‘ the Occasion of our finding many useful things in our way. If ‘ Chymistry has its Philosophers Stone; Geometry has its Squa- ‘ ring the Circle; Astronomy its Longitude; Mechanicks ‘ their perpetual Motion: All these it is impossible to find, yet ‘ it is very necessary we should seek ’em-----Morality also is not ‘ without its Chimera, which is a real Disinterestedness or per- ‘ fect Friendship. This is what we can never arrive at, but is ‘ good to pretend to; for, by so doing, we attain to a great many ‘ other Virtues.

Chap. 2. § 1. The Story which Dr. *Agricola* gives of the May-pole, is pretty enough. But this Custom is much more modern than some Authors who speak of the Art of Graffing.

§ 6. The Author pretends that the collateral *Branches* are ever a Year younger than the other, which does not always hold true. Nor is the Reason he gives for it solid; for it is no way necessary that the collateral *Branch* should be the *Daughter* of t’other, since it may very well be its *Sister*, to make use of Dr. *Agricola*’s Metaphor.

Ibid. *Inoculation* is a *Latin* Word, which the *Germans* make use of to signify the Operation here described. It is founded on that they (and we after them) call the *Buds* of *Trees*, *Augen*, or *Eyes*. I believe the *French* Translator has also call’d ’em *Yeux*. *Oculeeren* in *High-Dutch*, is properly what we call Graffing the *Bud*.

Chap. 3. § 1. It is not certain that this Fragment is of that *Hermes*, or *Mercury*. We rather believe he was call’d *Trismegistus*, that is, Thrice greatest, because he was King, Priest, and Philosopher. He was an *Egyptian*, and liv’d, as ’tis said, some little

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little time after *Moses*. We have nothing of his now remaining; for the two Dialogues which are ascrib'd to him are Supposititious.

Prop. 4. Incision is a *Latin* Word, which signifies Graffing, but more properly an inserting of any thing in another; as indeed to graff is to insert; and perhaps the Verb *Inserere* is us'd in *Agriculture* in its natural Sense, and the others are only figurative; for it is certain that we borrow a great many Words and Phrases from *Agriculture*, such as, To cultivate one's Talents; To reap the Fruits of one's Labour; To transplant one's self to another Place; To make Arts and Sciences flourish; and a great many others. We may here also take notice that the Translator has sometimes us'd the Word *Graff*, to express the *Branch* which is applied to another Stock; whereas it seems to me more natural to call it always the *Cion*; the Name *Graff* being proper to the *Stock* which that is inserted in.

Ibid. The Author alludes to the Bladders with Pease in 'em; which are given to Children to amuse 'em.

Chap. 4. § 1. Lasus was a *Greek* Poet, the Son of *Charbin*; born in a City of *Peloponesus* call'd *Hermione*; and liv'd about the 206th Year from the building of *Rome*. He was the first that wrote of Musick, and some place him among the seven Sages, in the Room of *Periander*. He excell'd chiefly in *Dithyrambics*.

Remarks on the Second Part.

Chap. 1. § 4. Philosophical Circle] is the Manner some Philosophers have us'd of proving one Proposition by another, and the second by the first. For Example: Suppose I prove it to be Day, because the Sun is risen; and again, that the Sun is risen, because it is Day. The Circle is generally look'd upon as faulty, because it is very rare that two Propositions have so perfect a Relation, as that they may serve to prove one another reciprocally.

§ 21. As

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§ 21. As the Author here treats of an Instrument newly invented, and which is represented Plate 14. the Translator not believing himself to be authoriz'd to create new Words after the *German* manner, seems to be at some trouble in expressing himself. The Chizels here spoke of are Joiners Chizels.

§ 25. The Doctor being desirous that his Secret should be learn'd by Heart, has, for the Ease of his Reader's Memory, contracted it into three Lines, of six Words each; but the Translator did not take himself to be under any Obligation of following the same Method.

Chap. 2. The Gentleman's Incision, the Earl's Incision, &c. have been all describ'd by the Author in his First Part.

Chap. 4. § 4. The Author calls the Spring the Balsamick Season, because indeed it seems to have the same Effect on *Trees* as Balsam has on the Wounds of Animals. All the World knows that the Spring renews and (if we may so say) revives all living Beings. When a Person has languish'd all Winter under a Distemper, we reckon our selves almost sure of his Recovery if he lives till Spring. On the contrary, Autumn not only causes Disorders in *Trees*, but also to the Bodies of Men. And the Fall of the Leaf has always been esteem'd a dangerous time for infirm Persons.

Chap. 5. § 1. Fallow Grounds are such as are left unsown for some time, after having born for several Years together; this is done sooner or oftner, according to the Goodness of the Soil, sometimes every ninth Year, sometimes in seven, and sometimes in five. There are some Places where Farmers having more Land than they can manure; they leave a third always fallow, which they stock with Cattle; in other Places they only plow the Ground up, without sowing it, in order to extirpate the Corn Roots, which would drain the Earth without any Advantage.

Chap.

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Chap. 6. § 6. Whoever has seen any fortified Places, where there is no River that runs thro' the Ditch, knows that the excellent Ground within the Fortifications is not lost, but is generally employ'd in fine *Gardens*, especially in those Towns which are not much expos'd to a Siege.

Chap. 7. § 1. These two Words, *Chymistry* and *Alchemy*, have in reality but one Signification, and many People confound one with t'other. Nevertheless Custom has made 'em to express two different Arts, the latter improving upon the former by the Particle *Al*; as if one should say, *Super-Chymistry*. Chymistry is the Art of separating the several Substances in mix'd Bodies, such as Animals, Minerals, Vegetables. Its principal Use is to draw from such Bodies Remedies for the restoring or preserving the Health of Man. But, thro' an unaccountable Use, we generally give the Name of Alchemy to that Art which pursues the Transmutation of Metals; so then an Alchymist is a Bellows-driver, who, in order to enrich himself, consumes all he can lay hold of, either of his own or others; an Art so much the more dangerous in that it generally leads to Coining, and from thence to the Gallows.





A PHILOSOPHICAL
TREATISE *of* AGRICULTURE;
OR, A
New Method of Cultivating and Encreasing all sorts
of TREES, SHRUBS, &c.

PART I.

CHAP. I.

Of the first Spring of Vegetative Motion lying in the SEED.

SECT. I.



THE first Principle or Spring of Vegetative Motion, or the Cause of Life in *Plants*, has its Residence in the *Seed-bud*, which represents the perfect Figure of the *Plant* in Miniature. This *Bud* is of the Form of a *Gland*, and is in a *Plant* of the same Use with *Descartes's Pineal Gland* in Mankind; in it we may easily discover where lie the *Extremities* of the *Trunk* or *Stem*, and the *beginning* of the *Root*, without the help of a *Microscope*. As soon

as this Part begins its Motion, the *Radicle* immediately shoots out, and then the *Stem* raises it self up, and opening its *Ear-leaves*, begins to explain its *Plume*, in which is contain'd the *Branches* and other *Shoots* of the *Tree*.

§ 2. All Philosophers and Naturalists agree that there is a principal Mover and lively Spirit in a *Tree*; for whatever is passive and immovable must necessarily require some Cause to put it in Motion, since, according to the *Axiom* in Philosophy, a Body cannot move of it self, but must necessarily be moved by some other Body.

In the *Seed* of a *Tree* the whole *Tree* is materially enclosed, as the *Root*, *Trunk*, *Branches*, *Leaves*, *Flowers*, and *Fruit*, and in them every thing which may promote its numberless Encrease; but these Parts are without Motion, and produce nothing till they are fertilized either above or under the Earth.

We have room to enquire in the next place, what Power it is within the Bodies of *Trees* which directs their Growth, and also in what their Substance consists, and what is their proper Essence.

But as these are Matters which regard the most subtle Philosophy, I shall leave them to the Study of the able Professors of that Science, and shall content my self at present with giving only my bare Opinion, that in every *Seed* of a *Tree*, whether it be great or small, there is a Principle of Life which promotes its Growth and Germination, altho' the Parts, where it is included, are sometimes so small, that they are hardly discernable. The largest *Trees* have sometimes the smallest *Seeds*, as the *Elm*, *Alder*, *Birch*, *Aspin*, and chiefly the *Willows*, whose *Seeds* are very small, tho' its *Trunk*, after it has taken Life, mounts to the very Clouds.

So that in short, if we reflect upon what has been said, we may say, that when the *Beetles* and *Pismires* carry about some sort of *Seeds* in the Fields and Woods, that they really carry so many entire *Plants* and *Trees*.

C H A P. II.

*Of the Situation of the FOETUS in the SEED of a
T R E E.*

IT may appear strange to some Persons, that I should say all *Trees* come from *Eggs*; but it is plain, that the Word *Ovum* or *Egg* is deriv'd from the *Greek* ὄν, which we may translate *Semen*, or *Seed*, by which a thing is engender'd and produced; and this Generation is agreeable enough with that which happens by the Coupling of a Man with a Woman.

It would be ridiculous to ask, upon this Occasion, whether there was found the Masculine and Feminine Genders among *Trees*, *Shrubs*, and other *Plants*; and there is good Reason to lay aside that Question; for it is equally by the *Organs* in the Genital Parts, that we discover the Distinction between the Masculine and Feminine Sex: But if we were to acknowledge a Gender among them, we might make them all Feminine, since they annually produce many thousand Children.

§ 2. My chief Design in this place is to make an exact Enquiry after the *Embrio* or *Foetus* of the *Tree*, and where it is situate; and for that End I have made choice of an *Almond*, which I shall examine with great Exactness, and Anatomise in all its Parts. I think we may very justly term the *Almond* an *Egg*, as it is possess'd of all the Qualities required in a real *Egg*; for as a common *Egg* is cover'd with a hard *Shell*, and under that has two *Pellicules*, or tender *Skins*, which enclose the *White* and the *Yolk*; the same is to be found exactly in the *Almond*: I may then very justly call it an *Egg*, as I shall farther set forth in the following Pages.

§ 3. In the first place I shall take notice of the outward *Hard Shell* (for at this time there is no Necessity of examining the green fleshy Coat, which is flung away, and has the exterior Figure of the *Shell*) the *Hard Shell* then is a little indented near the Top, as we may see Tab. I. Fig. II. from which place it makes a kind of *Oval* along the Sides to the Middle, where it begins to take the Roundness of an *Egg*, and terminates in a Point, somewhat resembling the Geometrical *Oval*, Fig. I.

Next we observe on its Outside, Fig. II. great Numbers of hollow and little Holes, for the Reception and Lodgment of *Nerves*, *Veins*, little *Glands* and *Tubes*, which make part of the green Covering. The Substance of the *Shell* is hard and unequal; for on one side (*a*) it is thick, and on the other (*b*) it is thin; and upon examining carefully the thick Side towards the Top, we find a small *Orifice* (*c*) capable of admitting the *Bristle* of a *Hog* (*d*), which reaches from the *Extremity* of the *Radicle* (*e*) to the little *Bud* which is enclosed.

If we would take off this thick Coat with a Penknife, it must be done with extraordinary Care, otherwise its Depth, as in Fig. III. (*fff*) would be lost, and we should not be able to trace that Conduit. This *Canal* is interspersed with *Veins*, *Nerves*, and little *Tubes*, in which we find the nutritious Juice for the interior and inferior Parts of the *Radicle* (*g*), where we may observe a *Reservoir* for the Reception of such *Juice* or *Sap* as is convenient for its Nourishment; this *Juice* is then absorb'd, and drawn to it by the *Navel-string*, as in Fig. IV. and is found in the first thin *Skin* (*l*), and then carry'd into the *Placenta* (*k*), which is very remarkable on the Top; but having receiv'd its necessary Preparation, it returns down by the *Veins*, which are plainly observable throughout the thin *Skin*, and so nourishes the *Embryo*, as we may observe in this Figure.

§ 4. When we take off the first *Skin*, which is of a *brown* Colour, and may be properly stiled the *Chorion*, or exterior Covering

Covering of the *Foetus*, we find beneath it a fine tender *Skin*, answering very well to the *Amnion* or *Interiour Skin* of the *Egg*, which immediately encloses the *Foetus*, as in Fig. V. It is extremely thin and smooth towards the *Stalk* of the *Fruit*, and is always moist, which renders the *Almond* enclosed in it somewhat *viscous* on its Surface.

When we remove the second *Skin* or *Coat*, the white Substance of the *Nut* or *Kernel* appears, as in Fig. VI. which is not unlike a certain sort of *thick Milk*, call'd *Almond Milk*; and when we draw that from its last *Skin* or *Covering*, its whole State is plainly remarkable, as may appear in the following Figure VII. (*m*) is the *outward Coat*; (*n*) the *thin Skin* which immediately encloses the *Nut*; (*o*) is the *Bottom* or *Tail* of the *Nut* or *Kernel*; (*p*) the *Basin* or *Place* wherein part of the *Radicle* is enclosed, and the nutritive *Juice* is absorb'd, after having pass'd through the *Navel*.

To go farther in the Dissection of the *Almond*, we come now to examine its inner Parts, and for that End the *Lobes* of the *Kernel* must be laid open or separated, which is very easily done. See Fig. VIII. which is the Book of two Leaves that I made mention of in my *Short Advice*, that I presented to several *English Gentlemen*, and in which I set forth how God produced *Trees* according to the Order of Nature.

As soon as this *Almond* is open'd, we discover the *Plum* at the pointed End, which contains the whole Form of the *Tree*, as we may observe at (*q*) in the last Figure; and in the other Part towards the Bottom we may remark a little Slit (*r*), and how the two Parts were united together near the *Radicle*; these two Parts alter their white Substance by little and little into a *green Colour*, and produce what I call the *Minor Seed* of a *Plant*, or the two *first Leaves*, from whence the *Root* as well as the *Trunk* draw their Nourishment, until all the Juices in those *Leaves* are spent; after which they diminish, dry, and either fall off or disappear,

appear, having compleated their Work, and perform'd their necessary Offices.

In the next place we must take notice of the little *Bud* in Fig. IX. when the *Almond* is not pregnant, it then never splits or opens, and is of the Figure of an *Egg*, agreeable to the Geometrical Plan. But as soon as the Principle of Vegetation begins to operate it opens, as we may see in Fig. X and XI. which represents a *Flame*, and divides in two at the Top, and in the Middle we find another like a little *Flame*, which comes out afresh. In this part is yet another much shorter, but thick, and of an oblong Figure (*u*), which is the Rudiment of the *Stem* or *Trunk*. At the Bottom is a Body figured like the Half of an *Egg*, which terminates in a Point at (*t*); in the first Part (*u*), or in the *Plume*, are contain'd the *Branches*, *Twigs*, *Leaves*, *Flowers* and *Fruit*, which may be observ'd in some measure by the *Microscope*, as (*w*) in Fig. XII. In Fig. XIII. is represented the opening of the chief *Stem* (*x*); and in Fig. XIV. at (*y*) we may observe, with the naked Eye, how Nature has grafted the *Stem* upon the *Root*; for it is evident to me that the *Stem* and the *Root* are not one continued Body, but by their Formation are two distinct Parts. But when the Life begins at the Center, and proceeds to Vegetation, the *Stem* and the *Root* are join'd together in such a manner, that they seem to be of one piece; for the *Root* has all the Parts observable in the *Stem*, as we shall set forth more at large in the ensuing Pages: And to give a better Representation of this, we may compare it to the *Head* of a new-born Child, on the Top of which we may discover the *Membrane* of the *Brain*; it appears at first like a little *Skin*, and of a different Substance from the *Cranium*, but is soon changed into a Boney Substance, and so strongly united with the *Cranium*, that it cannot at last be perceiv'd.

There remains yet for our Observation Fig. XV. which shews us by the *Microscope* the Place where the *Vegetable* Life has its
Resi-

Residence, or, as we have already mention'd, the *Pineal Gland*, in this wonderful Point are lodged such Things as are incomprehensible.

§ 5. If we have a mind to expedite the Germination of this *Bud*, so as to make it appear in a few Hours without a *Microscope*, make use of the following *Liquor*.

Take three Ounces of rectified *Spirit of Wine*, to which add a quarter of an Ounce of well purified *Nitre*; put this *Liquor* in Digestion, that is to say, to infuse in a warm place till the *Nitre* is quite dissolved; when that is done, put in several *Almonds* to steep and soften for twelve Hours in a temperate Place, then take them out, and set them in good fat Earth, watering them with common Water, and they will immediately sprout.

Those who are curious in such extraordinary Vegetation, have no more to do than address themselves to the learned Dr. *Jean Christian Lehman*, Professor in Philosophy and Physick in the University of *Leipsick*, and Member of the Royal Society of *Berlin*. I have just receiv'd his little Work, which treats of the *Stove*, and upon examining it, find that the Author, after much Pains and Charge, has, for several Years successively, made many very curious Observations. I wish he may continue the useful Work he has so well began, and not only pin himself down to improve the sudden Vegetation of *bulbous Roots*, but also bend his Mind to expedite the Growth of *Trees* and *Shrubs*, which as yet he has not treated of, by which means we might both together procure inexpressible Advantages to all Lovers of *Gardening*; but these Thoughts carry me too far from my Subject, I shall therefore return to my dear *Embrio*, and examine whether every thing that grows must at first be engendred and produced by a *Seed*.

For my part, I declare my self on the Affirmative side of the Question, in as much as the Commandments and Orders of God are, that every *Vegetable* and growing Substance shall have its
Seed

Seed within its self, as may be seen, *Gen. i. 11.* Now, according to this wise Law, every thing that grows, or is produced, ought to grow, or be produced from a *Seed*; for this Order is fix'd, and permanent, as long as the Heavens endure; and this is a sufficient Proof of my Assertion. In the mean time I know there are a great many Opponents, who having recourse to Experiments they have made, pretend to prove that GOD has left some other way in Nature, by which a thing may be produced without *Seed*. But this we leave to the Decision of *Chymists*, laying it down as an incontestible Fact, that, according to the aforesaid judicious Law of the All-wise CREATOR, all growing Beings ought to have their Beginning from, and be born of a *Seed*.

As to my *Embryo* or *Fœtus* of the *Tree*, not yet arriv'd to Maturity, I say it is the little *Germ* or *Bud*, which being enclos'd in the *Seed* composes the prime and most noble Part of the whole, and which, according to the Calculation of some curious People, makes hardly the thousandth part of the *Seed*; but, be it so or not, the Image or Representation of the whole *Tree* is nevertheless perfectly delineated and express'd in it, and this principal Part being any way hurt, spoil'd or lost, the *Seed*, however otherwise large or perfect, will come to nothing, but will rot in the Earth. On the other hand, 'tis wonderful to see that this little *Germ* plaister'd over with Wax, being planted by it self in the Ground, shall push forth and grow a little; but as it draws no Nourishment from the Bosom of the *Seed*, nor from the two first *little Leaves* or *Ear-Leaves*, whence it ought to have its first *nutritive Juice*, we generally see it wither and die. We may add to these Thoughts what indeed deserves our Attention, which is, that the *Seed* of *Fruits*, when separated from them, though not kept in the Earth, shall live fresh and healthy a great many Years, by means of its intrinsic Spirit; but when it grows very old, it becomes unfit for Vegetation. The Books of common *Gardeners* tell us how long *Seed* will properly last. *Robert Morison*

Morison in *Præ lud. Botanic.* p. 496, pretends that no *Seed*, keep it ever so well, will endure more than ten Years, nor after that time is fit to be sown; and that the more ordinary sorts remain good not above five Years: That of a Year old is commonly the best; that of two is still good; that of three indifferent, but older than that is seldom worth any thing. Most *Gardeners* are of a contrary Opinion; for there are *Seeds* which they esteem the better for being two or three Years old, or even a great deal older; but 'tis not worth while to meddle with that sort of People, for the Generality of common *Gardeners* have so little Apprehension, that 'tis all one what one says to them, whether good or bad. It suffices that our Reason informs us, that *Seed* of a Year old is best, for then the Spirit is still fresh and lively; the Juices, which are the Principle of the Nutrition and Growth, are still susceptible of Motion in the Places of their Residence, and the whole Machine, the whole Structure is in a good Disposition; but when, thro' Age, the Juices are consum'd or dried, and the *Organs* are otherwise modified, then the moving Vegetative Principle can act no longer, nor continue its Office, no more than the intelligent Soul can continue its Action in a human Body, when the solid Parts or the Humours are consumed and wasted; in this manner it returns to the Air whence it proceeded. In the mean time, 'tis easy to conceive why the Vegetative Soul remains longer in one *Seed* than another, in the long and round longer than in the flat and small *Seed*; for in the large and round *Seed*, as well as in the *Oval*, the Juices by an interior Motion circulate more freely, and have a greater Circuit: It can neither evaporate nor dry so soon, because the Juices are in greater abundance than in the small and flat *Seed*.

When the *Seed* enters the Earth with all things requisite, and is no ways damag'd, but is well water'd, and enjoys a temperate Heat, it becomes fertile, and the interior Spirit sets the vital

Juices in Motion, and excites a Fermentation, which occasions all the Parts to split and dilate; which when sufficiently done, and the Parts which contain'd them become too little, the *Seed-bud* opens it-self a way, and endeavours to make room above as well as below, and to dilate all its Parts, which were before pent up, as we shall better explain in the Sequel; and for a Conclusion of this Chapter, we shall here give our Judgment in what manner one may advance or forward the Growth of *Seeds*.

My invitatory Letter, which I some time ago sent abroad, brought me to the Acquaintance of a great many curious Persons of Distinction, and has reviv'd my Correspondence with some of my old Friends. Mr. *Leonard Herman* Pastor of *Maszel*, in the Principality of *Oelsbernstad* in *Silesia*, among other Curiosities, wrote me an Account in what manner Grains of *Seed* may be made to grow very suddenly; these are his Words: ‘ In the Name of God, I shall here
 ‘ communicate sincerely, and, according to my best Know-
 ‘ ledge, the way we ought to treat *Corn*, and especially
 ‘ *Wheat*, to have a plentiful Harvest from a *Barren* and
 ‘ *Sandy Land*, not doubting, but if the following Method be ob-
 ‘ serv'd without any view of Avarice, but only to the Glory of
 ‘ God, and the Service of the Poor, or for your own Use, or
 ‘ that of those who have little Ground, you may attain your End
 ‘ with Utility and Pleasure. To this Purpose, you must, when *Seed*
 ‘ time comes on,

* ‘ 1. Make a good *Lye*, to the Quantity of the eighth part of
 ‘ a Bushel.

‘ 2. Put to every Bushel an eighth part of a Bushel of *Bay-*
 ‘ *berries* boil'd, and squeez'd into the *Lye*.

‘ 3. Take three or four Pound of *Salt Petre*, clean and pure,
 ‘ dissolve it in the boiling *Lye*, and let the whole be well mixt
 ‘ to-

* The Translator supposes that the Composition of the Lye depends upon the Ingredients mention'd in the second and third Articles.

‘ together; some are for calcining the *Salt Petre*; but as it loses too much of its Strength by the Fire, I believe it will be better for this Purpose, to make use of it the ordinary way.

‘ 4. When the *Lye* is prepared with this Mixture, and a little cool’d, put thereto a Bushel of good *Wheat*, new, and well clean’d.

‘ 5. Let it steep eight Hours, then let the *Lye* run out of the Vessel by a Hole at the bottom, and dry the *Corn* in an airy Barn out of the Sun; and when the Weather is favourable put it again into the *Lye*, and after seven or eight Hours take it out and dry it a little. And

‘ 6. When the Ground is prepar’d we sow it in a convenient Place, for it begins immediately to sprout, and if it penetrates the Ground readily, the *Corn* will be of a pretty height in three Days; but it must be look’d to a little that no harm come to it.

‘ The Advantages that arise from it are,

‘ 1. That you may take for this purpose the worst and sandiest Land that is; tho’ it will grow in good Ground, but there it must be sown very thin. But this Invention is calculated only for Country Farms, which often are in so bad Land, that no other Use can be made of it.

‘ 2. Here is no need of Dung; for this way the *Seed* is already manur’d, and this Manure, which from the Beginning unites with the Life of the *Seed*, is much more advantageous to it than Dung; the Salts of which are soon dissipated by the Warmth of the Sun, and consum’d by the Hotness of the Soil.

‘ 3. You need sow only the half of what is customary; and instead of two or three Bushels which we had formerly need of, you use here but one; for this *Corn* sprouts with vast Encrease, so that one Grain shall produce ten, twelve, or more Stalks.

E X P E R I M E N T.

‘ I made an Experiment in Autumn 1715, that gave me great
 ‘ Satisfaction; for a Bushel of *Wheat* thus prepar’d, produc’d me
 ‘ above three hundred Sheaves, which yielded eight Bushels, and
 ‘ three quarters of a Bushel, of *Breslau* Measure, which is certainly
 ‘ an abundant Harvest from one Bushel, in so bad a Land; for
 ‘ which, Glory be to the Almighty.

‘ Now whether *Corn*, which had lain a good while after its
 ‘ being thus prepar’d, before I sow’d it, which was last *Seed* time,
 ‘ 1715, without any new Preparation, will grow well, is what
 ‘ the next Harvest will shew me, if it shall please God; at present
 ‘ it promises Wonders. Among other Advantages, ’tis pretend-
 ‘ ed that the Meal of *Corn* thus prepar’d will not grow musty, of
 ‘ which I intend to make a Proof, having some of it now at the
 ‘ Mill.

But these two ways are of no great Advantage to the *Seed*, as
 to its Growth, since they consist only in the *Salt* of *Nitre*.
 I shall publish in time, after the exactest Proof and strictest
 Search, what I can do towards the extraordinary and sud-
 den Production of all sorts of *Plants*, by means of my *Mer-*
curial Salt, which is compos’d of that *Liquor* which I call
 the *Universal Metallic Dissolvent*, the Discovery of which is
 due only to me. In the mean time I can relate one of its
 Effects, which is, that after having dissolv’d it in the Air,
 pour but some few Drops into the Pith of the *Tree* (for ’tis
 without taste, and no way corrosive) it occasions an extraordi-
 nary Growth in twelve Hours time, or little more: But here’s
 enough of this Matter for the present.

T A B L E the First.

Which shews the Embrio or young Almond-Tree in its natural Situation in the Egg or Seed, with all its Parts, external and internal.

Fig. I. *Is an Oval Figure, like the Form of the hard Shell of an Almond, as might be demonstrated by Geometry.*

Fig. II. *Represents an Oval Almond-Shell shut, and (A) shews the hard and thick part, in which is a secret Passage; (B) the Substance freed from the Shell; (C) the Hollow or Cavity, with a kind of very fine Silk; (D) the way of its Descent to the bottom by the secret Passage (e).*

Fig. III. (fff) *The secret Conduit, in which is an Assemblage of Veins, Nerves, and Lymphatic Vessels, which terminate in the lower Point (g).*

Fig. IV. (h) *the Navel-string which descends from the Cover of the Matrix to the Point (h); (i) the little Veins; (k) the Cover of the Matrix where the Navel-string takes its Rise.*

Fig. V. *Shews how the brown Bark (l) is loosened, and how we may see the Cover of the Matrix, to which the interior Skin is joined by the smaller Veins.*

Fig. VI. *Is the Inside of the Almond stript of all its Skins, resembling a naked Infant.*

Fig. VII. (m) *is the brown Bark; (n) the inner Skin and Cover of the Matrix; (p) the Basin or place of its Deposit.*

Fig. VIII. *The Almond cut and laid open; (q) the little Seed-bud; (r) the little Overture that answers it.*

Fig. IX. (a), *How the Seed-bud or Germ taken out of the Egg, is wrap'd about.*

Fig. X.

Fig. X. *How the Seed-bud separates into three principal Parts, (viz.) the Plume (s), the Trunk (t), and the Root (u).*

Fig. XI. *How the Bud opens and explains it self after 'tis fertilised, and how all the Parts swell and dilate, as (S: T: U:)*

Fig. XII. *How the Plume (U) opens it self after it is fertilised, and of all the Shoots of the Tree which we may remark in it.*

Fig. XIII. *Shews us the Trunk (X), and how it joins to the Root.*

Fig. XIV. *Is the third Capital Part, i e. the Root (Y) wherein we may perceive by the naked Eye, how Nature has grafted the Trunk upon the Root.*

Fig. XV. *How the three foregoing Parts, when they begin to vegetate, viz. the Plume, the Trunk, and the Root, appear in the several States, as also of the Union of the Root with the Trunk; and above all, that marvellous Point (Z), where is the Residence of the Vegetative Soul, as we may observe it with a Microscope.*

C H A P. III.

How all the Parts of a TREE spring forth and extend themselves, and proceed to Perfection,

WHEN the Germe or Seed-bud is impregnated, as I observed in the foregoing Chapter, it grows bigger, its Strength encreases more and more, till at length it makes a convenient Opening, and pushes forth its Parts, some upwards, and others downwards.



Fig. I.

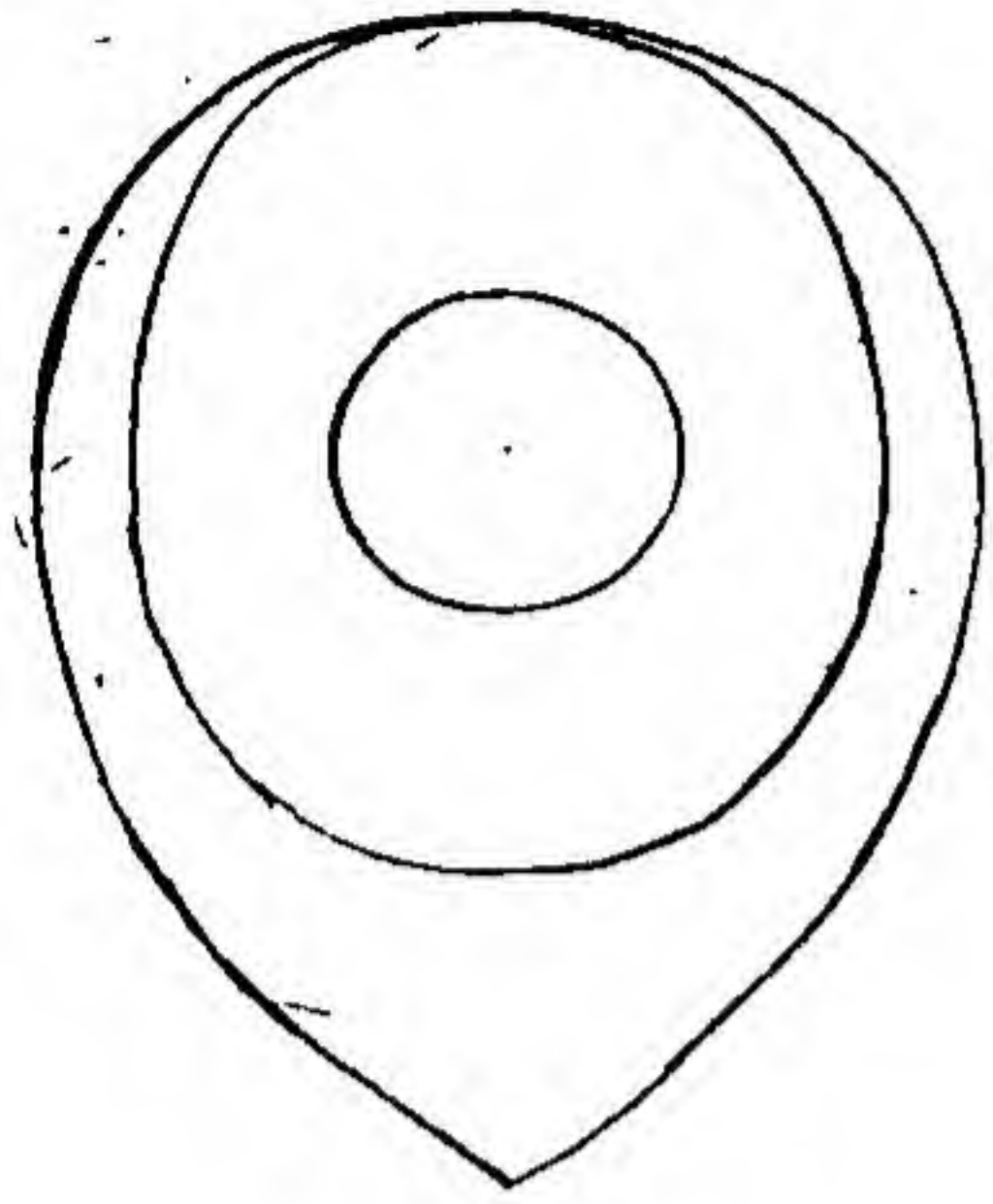


Fig. II.



Fig. VI.



Fig. V.



Fig. IX.



Fig. X.



Fig. XI.



Fig. XII.



Plate I

Fig. III.



Fig. IV.



Fig. VII.



Fig. VIII.

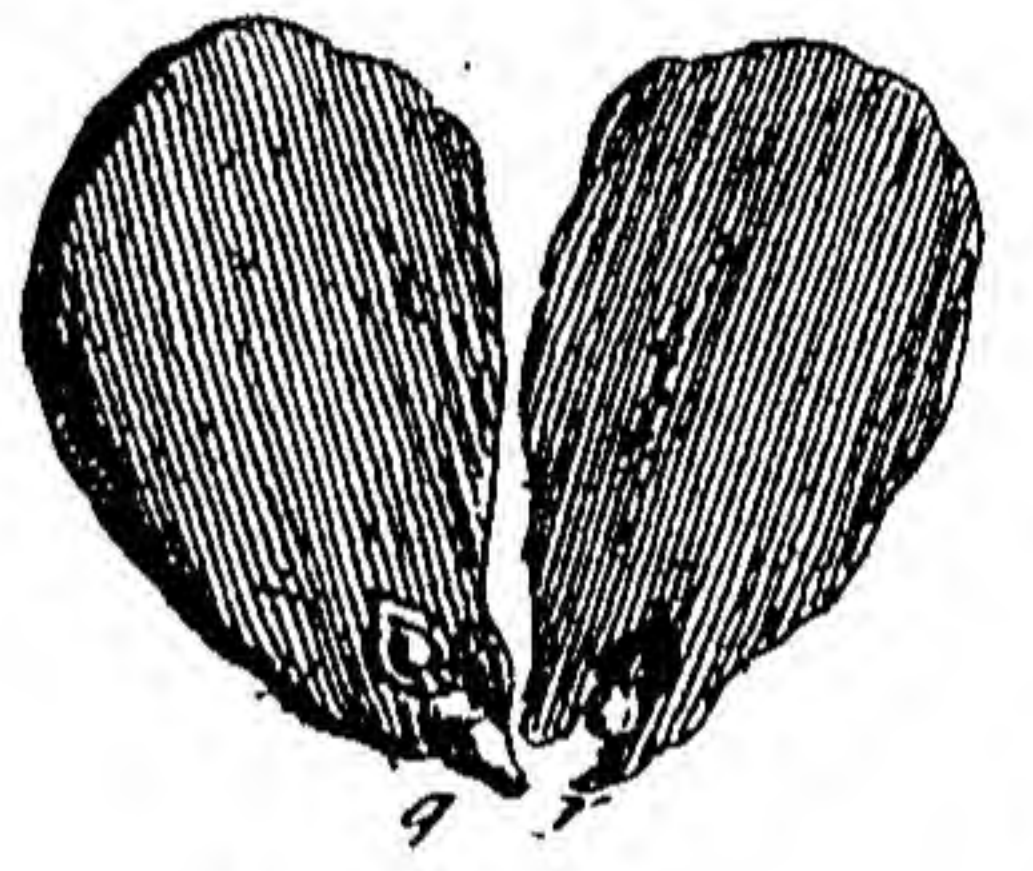


Fig. XIII.



Fig. XIV.



Fig. XV.



In the first place appear the *Roots*, and this happens from the Nature of its Situation, being the *Root* is nearest to the Opening; and as the *Fœtus* has absolutely consumed all the Nourishment, and has yet never the less Occasion for other nourishing Juices, the Spirits force the *Root* out for the better drawing through its *Orifice* and porous Substance the *Vegetative Salts* of the Earth, so that the growing Parts may be sufficiently provided therewith. Experience teaches me the Truth of it; for having last Year, very late in Autumn, planted six *Peach* Stones in a Box, they began to shoot; I took them out of the Earth at several times, and made the following Observations: When I took out the first *Stone*, I found it disposed, according to Fig. I. Tab. III. which below, near the Point, shot out a long single *Root*, without any *Fibres*; the Top of the *Stone* was somewhat opened, and I could perceive, through the Slit, that the *Kernel* within was ready to germinate. Some Days after another *Stone* shot forth its *Plume*, as in Fig. II. when this was pulled out of the Earth, we could observe not only the principal *Root*, but also that it had several small *Fibres* on the side of it, without doubt, because several small *Leaves* appeared also on the Top. From hence we may conclude, that having need of more of the nutrimental Juice, Nature put out more little *Roots* for the better Attraction of Nourishment to it. The Place of its Residence was likewise more open than that of the first. A Fortnight after this Observation I examined the other little *Peach-Trees*, and found, that those which were cover'd in a warm place, were well sprouted, and all of the same Bigness, as in Fig. III. IV. and VI. but the *Kernel* in Fig. V. was not shot so high above Ground as the rest. I then began to examine the four little *Peach-Trees* in the following manner; In that of Fig. III. I could plainly perceive the little *Fibres* on the sides of the *Root*, which had shot out in great Numbers, and it seemed to me that there were as many *Roots* as small *Leaves*; I dare even say, that when
all

all goes on in good Order, a *Plant* puts forth as many *Fibres* at the *Root*, as it shoots out *Branches*, *Buds* and *Leaves* in the *Head*; but we must take some Pains to be assured of it: Besides, I have observed, that the two hard *Shells* of the *Stone* (*aa*), and the two first small *Leaves* (*bb*), divided themselves in four parts. In (*c*) we may likewise discover a perfect joining; and may also observe, that from the two first small *Leaves* there comes forth a smooth thin *Skin*, which covers the whole *Root*, and gives it a particular Colour, being in its Composition, like a Sieve full of small Holes, as it may be observed with a *Microscope*. When I took the *Stone* out of the Earth, I found the *Kernel* yet half in its *Shell*, as Fig. IV. In this I observ'd, that the *Stem* had a large Knot, and binding near the place of its joining with the *Root* (*e*); but it was also easy to distinguish by the Colour, the Separation between the *Stem* and the *Root*. As from this first Observation I drew light enough to know that those two Parts were not at that time absolutely joined, I was the more curious to compare their inward Parts one with the other; for this end I pulled the sixth *Tree* out of the Earth, which was as big as the other two, and with much Care I split it in two parts with a Penknife, from Top to Bottom, as Fig. VI. On one side there was yet remaining the first *Leaf* (*f*), from which came forth the *Medulla* or *Pith* in two parts, composed of many *Fibres*, leading to the *Knot* (*h*), where they formed a sort of *Basin* (*i*), and in the middle of it is plainly observable a little Spot, where there was a Point (*k*), as may be seen in Fig. IV. By this I was confirm'd in my Opinion, that the Parts in *Plants* unite and join themselves more and more, after the same manner that the solid Bodies are constituted in Men or Animals, where, in the Beginning, several consist of one, two, or three Parts, which, in the Time of Growth, are link'd to one another, in such a manner, that many Parts compose but one.

I find likewise that these two distinct Parts, *viz.* the *Stem* and the *Root* join, so perfectly, as to have not only the closest Union one with another, but also all the Parts join themselves together after the same manner, so that not the least Difference is to be seen, except only that the *Stem* has one thin *Skin* less than the *Root*; and likewise the stringy Parts of the *Root* are more open and porous than those of the *Stem*; for the open Air presses those last one into another; while the first, for want of Air, and from the Abundance of Moisture they receive, are more dilated and enlarged. You may therefore easily discern this joining on the Outside of every *Tree*, it being thicker than any of the *Stem* it self; and if we draw some of the *Fillaments* or *Strings* from the Top of the *Stem* to the extreme Parts of the *Root*, we find them run in a strait Line, from whence we prove the perfect joining of the *Root* with the *Stem*. And tho' this Enquiry may seem at present somewhat out of the way, yet it will hereafter bring many Things to light.

After this Contemplation, I was surpris'd to find, that among all those Stones put into the Earth, the *Tree*, Fig. V. was the least, tho' it had as many *Leaves*; but it was not grown so tall as the three others, tho' they had been set at one time. When I had drawn it out, to enquire after the Cause, I found that, through Carelessness, I had planted it wrong, being the pointed Part was upwards, and the round and broad Parts lay downwards, which hindred Nature in her Work; therefore I examined it with great Attention, and found that the *Root* must necessarily bend it self in an extraordinary manner, and in a Semi-circle. One of the chief Reasons that may be given is, because it could not enter into the Earth in a streight Line: The *Stem* likewise could not germinate with better Success, being kept back in its Growth, because the Root had not yet gathered the Nourishment necessary for it; the Junction with the *Root* (*b*)
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lay quite cross, as did also the *Stem* it self (*m*); and what more contributed to this was, that the first small *Leaf* (*w*), which was yet in the *Shell*, did not appear very found; and as that also lay cross, it could not furnish the *Stem* with *Sap* sufficient to nourish it, but might do it very well to the *Root* (*p*), which was in this *Plant* much longer than the *Stem*, but in the other small *Trees* was otherwise. It appears sufficiently, that Nature, by means of this Fault in me, was crossed in the Exercise of her Employment; and what extraordinary Pains she must take to make good the Carelessness or Ignorance of Men.

This Figure gave me Occasion to enquire how and in what manner the *Seed* ought to be set into the Ground, and what is the certain Mark or Sign by which we may be assured that the pointed Part of the *Nut* should be set downward. There is much to be said of the Debates and Disputes that have been among the *Botanists* about this Question, as a Matter of the greatest Consequence; for a great deal of *Seed*, which has been set in the Ground unskilfully, was not only hindered from rising at all, as it has been proved already, but was quite suffocated and rotten, which is one Reason why some *Seeds* or *Stones* do not come up. All *Seeds* enclosed in *Shells* ought to be set or planted with the Point downwards; those that are oval or oblong must also be set with that End downwards, which is the Place of the *Root*. For Instance; it is the same with *Pease*, *Lentills*, *Beans*, &c. as in Fig. VII. In making a Trial of the *Pea*, I may observe to those who are so serious about the *Masculine* and *Feminine Gender* in *Plants*, that there is still a third, which may be called *Hermaprodite*.

For in the exterior Part of a *Pea* we may perceive the Marks of the *Male* and *Female*, as in Fig. VIII. It must be observed also, that the Circulation of the nourishing Juices is quite another thing in the *Seeds* as have a hard *Shell*, than in those
which

which have more tender Coverings; for when the first are yet upon the *Trees*, the Point where the *Root* is stands upwards; and for this Reason the *Navel-string* rises up. From hence proceeds the Error of so many People, who imagine, that because the thick End is downwards next the *Stalk*, it must be set in the same manner in the Ground: This may do well enough for *Seeds* that have not hard *Shells*; for in the same manner as they lie within the *Fruit*, so they ought to be set in the Ground, as in the *Kernels* of *Lemons*, *Pomgranates*, *Oranges*, &c. but it is another thing with those that are in *Shells*, whose Point must be turned down. Besides this, there is another certain Mark (*i. e.*), when you take off the outer Covering, the *Placenta* appears very distinctly, as may be seen in the *Kernels* of *Lemons* and *Oranges*, which we have drawn for that Reason in Fig. VII; the Place where that is found must always be set upwards, for the *Root* is below. There are some who call themselves *Gardeners*, that have no great Knowledge of what they sow, and do not know whether they must set the Point of the *Seed* upwards or downwards. In this Uncertainty they lay it upon the Side, thinking themselves sure it could not fail them, not knowing that by this way they hinder the regular Growth of it. For it may easily happen, that the Part from whence the *Plume* proceeds may be set downwards, and the *Root* upwards; and then the *Seed* coming to germinate, it surely happens that the *Root* turns upside down, and the *Stalk* the down-side up: This gives a great Hindrance to the growing Substance, and after causes the total Ruin and Suffocating of the whole *Tree*, as may be observed in Fig. IX. I conclude then that the *Seed* ought always to be placed with its *Root* downwards, chiefly those of the *Stowe-Fruits*, or whose *Seed* is cover'd with a hard *Shell*, for then the *Root* shoots downwards in a streight Line, and draws its Nourishment from the Earth without Restraint, and communicates it to the *Stem*, which is prepared to vegetate on the Top. I could say much

much about the Reason why the *Root* is sometimes white, sometimes black, yellow, red, purple, of a brimstone Colour, or Violet, &c. but it is not here the proper place for it. I shall therefore proceed to describe the other Parts of the *Tree* which are produc'd from the *Seed*, after they have quitted the *Shell*, or Place of their first Abode.

After the *Root*, follows the *Trunk* or *Stem*, as the *Botanists* call it. The *Stem* is that part of a *Tree* which proceeds from the *Root* upwards; and as we have said enough already in the foregoing Chapter of its joining with the *Root*, I shall here describe its interior Parts; and shall observe in what manner the learned Anatomists of *Plants* have drawn the Comparison between the *Stem* of a *Tree*, and the lower part of a Man's Belly.

According to *Malpighius's* Introduction, I have carefully examined a young *Oak* with the *Microscope*, and have anatomized it in the following manner: Having taken off the first *Rind* or *Bark*, as also the next Coat, and after that the spongy Parts, so that I had quite stript the *Stem*; I cut off about the third part of the woody Substance; I then examined this Wood with a *Microscope*, and found a long *Canal*, wide, and separated, which presented it self like the *Esophagus*: Near the *Root* there were a-bundance of nervous *Fibres* lying transversly, resembling a *Sphincter*, being capable of opening and shutting, as in N^o 1. through this *Conduit* or *Canal*, without doubt, passes the *Sap* which comes from the *Root*, and is carried up the *Tree* by an inward Principle of Motion; but because this *Chyle* may not return back the same way, there is a *Valve* placed between them both, as in N^o 2. On the Side of it is to be seen some little ones, which resemble the *Intestines*, and which probably draw to themselves the *Chyle*; and after having sufficiently digested it, send it forwards to other Parts. On the other Side of the great *Tube* is a sort of Net, in which there is something almost like unto *Glands* of different Sizes. There is a great Likelihood

lihood that this is the Place where a Separation is made of the digested and prepared *Liquor* proceeding from the long *Ventricles*. Having again cut a part of the *Stem*, we had the following Figure, N^o 3. by the *Microscope*; wherein I discovered what I thought to be *Lymphatick Vessels*, or *Sap Channels*, with their *Valvulas* and *Separations*, as in N^o 4. but penetrating still further, I found only some Spots, as to be seen in N^o 5. which seemed to me somewhat like *Glands* cut in pieces; and when I came almost to the *Medulla*, the *Stem* or *Trunk* presented it self, as in N^o 6. I intended to have examined this more carefully; but as this exact Inspection seemed to me only a meer Curiosity; I quitted that Design, and proceeded to examine the *Branches* which rise from the chief *Stem*, together with the small *Buds* that relate to them. As the *Branches* have their outward Parts common with the chief *Stem*, so do their inward Parts consist likewise of a Multitude of *Tubes*, which are also provided with abundance of small *Glands*, *Veins* and *Muscles*, interspersed here and there, where the *Sap* coming from the first *Canal*, is rendred much more delicate: Those *Branches* divide themselves anew into lesser Parts, and those again are subdivided into smaller Shoots; but when they are cut close to the Joints, we may discern how the small *Veins* and other *Vessels* return on one side, and come out on the other in Spiral Lines alternately, giving us the Appearance (sometimes on one side, sometimes on the other) of small Drops, or *Globules*, call'd *Buds*, which they fill with the purest *Sap*: They may be also considered as small *Eggs* or *Seeds*, as they contain *Leaves*, *Flowers* and *Fruits*. The *Leaves* which first explain themselves are the *Placenta*, or Coat of the little *Buds*; the *Foot-stalk* of the *Leaf* is the *Navel-string*; for by that the nourishing *Sap* is convey'd to it, and divides it self into the *Sinuosities*, or Circuits, which are found throughout its whole Structure, by which means the nourishing Juice is refined, and in part may receive the most Spir-
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tuous Particles of the Air. We ought also to observe, that if we take the adjoining *Leaves* to a *Bud*, it will shoot no more till fresh *Leaves* come forth again to succour it; for the *Leaves* in this case do the same Office which the *Ear-Leaves* do to the *Germ*, in its first State of Vegetation from the *Seed*. It may be proved by *Graffs*, that the same vegetative Powers are residing in each little *Bud*, as are in the *Seed*; for chiefly there is found in it a *Particle* of Vegetative Spirit, notwithstanding it is difficult to comprehend how this Species of Soul could multiply it self so as to fill every *Bud*, yet one may conceive, in some manner, how that may be, if we examine a lighted Candle; for with the same Candle one may light a thousand others, and not diminish the Light of the first, tho' so many Lights are come forth out of one. Secondly, since that little *Bud* is grafted upon another, it unites it self with it by a kind of *Calus*, that fixes it to the *Stem* instead of a *Root*. After this there appears the *Branch* with his little *Twigs*; and among those we find some *Buds* for *Flowers*, and consequently for *Fruit*, in which *Fruit* is such *Seed* as will produce *Trees* of the same Genus or Tribe of that from whence it sprung: If those Parts were not virtually residing in each respective *Bud*, how could they come forth?

We must next examine the *Leaves*, which we have already once mentioned; they are properly the most extreme Part of a *Branch*, and the Ornament of the *Twigs*, and consist of a very glutinous Matter, being provided every where with *Veins* and *Nerves*; a *Leaf* may be compared to a Fishing-Net, because of the *Pores*; or to the *Lungs*, because of the *Vesicles* or little *Pipes*, which are visibly discovered in some *Leaves*: Their Office is to subtilise, and to give more Spirit to the Abundance of nourishing *Sap*, and to convey it to the little *Buds*. Thus we may see that when there is but one *Leaf* to cherish a *Bud*, the *Branch* is then a Year old; but if there be more than one, the *Bud* is not only two or three Years old, but it is a Sign likewise that it is in a bearing

bearing State; and also, that it has need of more Nourishment than the first: Besides this, the *Leaves* serve to cover the *Flowers* and the *Fruits* with their Shade, and to keep them from other Inconveniencies, as also to make the *Tree* look pleasant to our Sight.

Concerning the *Medulla* or *Pith* of a *Tree*, it is found in its Center; it is of a spongey Nature, and consists of little *Tubes* and *Vesicles*, *Muscles* and *Nerves*, in which resides a glutinous Matter which rises from the lowermost part of the *Root*, even to the Top of the *Tree*; some will say that it is the principal Seat of the nourishing *Juice*, and that it is digested there, and prepared to disperse it self through all the Parts. Their Proof is grounded upon a Notion, that when the *Pith* is wounded, the *Tree* must dry and decay, which we may in some measure agree to; but it does not prove that all the Nourishment comes from the *Pith*: If we were to peel off all the *Bark* of a *Tree* it would likewise perish; but does it follow from hence, that the nourishing *Sap* only is contain'd in the *Bark*; or is it rather in that part where it finishes its Course? But we shall prove fully hereafter that it is not so. But suppose it was granted, that the *Pith* only performed the Work of Nutrition, what Reason could be given for *Trees* and *Shrubs*, that have no *Pith* at all; or in which, if it is burnt or taken away, they nevertheless live and grow? Some will answer, that tho' a considerable Portion of the *Pith* were spoiled and lost, there will nevertheless be found yet in the *Root* or other Parts of the *Tree* enough of that Substance, Nourishment, and Maintenance. The Disposition will be the same in regard to *Trees*, that are absolutely without *Pith*, because the parenchymous Parts of the *Roots* may in some measure supply its Place, and convey Nourishment to the *Plant*. But we may conclude from thence, that they don't know themselves where to fix their Opinion concerning the Certainty of the Place where the nourishing *Sap* is to be found. But we come now to
clear

clear that Difficulty: As to the Use of the *Medulla* or *Pith* of a *Tree*, I attribute to it the same Design as the *Marrow* in a Man's Bones, which by its balsamick and oliaginous Substance keeps them from being dried up, by which the Bones would easily break. The same is in *Trees*, which being very much shaken by the Winds, if they had no *Pith* they would become dry, and be easily broken. Moreover, there are found also in *Trees* all sorts of *Veins* and *Arteries*, which traverse all their Parts; the first are design'd to carry the *Sap* through all the *Branches*, and the others to return it back to the *Root*; but it is very difficult to find out the first Principle or Heart, from whence they have their Rise. However, if we examine the Place where the pineal *Gland* lies, to wit, the Junction of the *Stem* with the *Root*, we may find a kind of *Sinuosity* with a small Spot or Point. It is probable that the Principle of the *Arteries* and *Veins* may be there found; for we discover coming forth from thence two great Ramifications shooting on both sides, one of them running up through the *Trunk*, and the other descending into the *Root*, and spreading themselves every where; but we shall make a more exact Enquiry into this Secret. We know that there are two sorts of *Vessels*, or different Kinds of *Veins*; some of those which are largest go straitning themselves, while the others which are narrower grow larger. We find these as well as the *Nerves* spread through all the Parts of the *Tree*; they convey the nourishing *Sap* from the *Ventricles* to all the other Parts; and then passing by a *Gland* or *Lymphatick Vessel*, the rest of the *Liquor* turns back again through the *Veins*. It is from this *Sap* that the *Nerves* also draw their Nourishment; but we may more easily conjecture than prove, that it is in the Center where the Concourse of all the *Nerves* are assembled. It is plain that all *Trees* have *Nerves*, and it cannot be denied but they have also their *Carties*, wherein is some Share of *Sap*. We shall prove by and by that the whole *Tree* is composed of an infinite Number
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of small nervous Filaments. I might here treat of the *Sap-Conduits*, and the *Flesh* of a *Tree*, as also of the *Bark* or *Rind*; but I shall only at present take a cursory View of them. First, as to the *Sap-Conduits*, they are found every where in very great Numbers, as we may observe on the Dissection of the *Stem*; the *Sap* which is found in them is like clear Water, and when the *Trees* are wounded or spoiled, runs from them plentifully, as we see in the *Birch*, and other *Trees*. As to the *Flesh* of a *Tree*, you must not think that we suppose it to be strictly like the *Flesh* of *Animals*; tho' some Persons report, that in *Scotland* there grow upon *Trees* *Lambs* and *Ducks*, every one provided according to its Species, with *Wool*, *Flesh* and *Feathers*; but these are only ridiculous Fictions. It is granted indeed, that some *Vermin* engender upon the *Flowers*, *Leaves*, *Fruits*, and *Seeds* of *Plants*, especially when they begin to rot; and there is also room to believe, that each *Plant* breeds its peculiar *Animals* and *Vermin*. The Lovers of *Gardens* are very sensible, that oftentimes whole Troops of these little *Animals* are found feeding like *Sheep* in the Vallies and Fields; and such as would exactly describe them, would certainly produce a very curious Work. But what the *Botanists* call *Flesh* in *Plants*, is an Assemblage of the *Fibres*, *Nerves*, and *Vessels*, which so closely unite and join themselves together, as to give the Appearance of *Flesh*; and this Substance is commonly found under the *Bark*. We may compare the *Bark* of the *Tree* to the *Skin* of *Animals*, which is design'd for the Preservation of the inner Parts; it properly consists of different Parts, as the *first Skin*, the *Bark*, and the *Peritonæum*, which encloses the inward *Stem*.

Concerning the *first Skin*, the Question is, whether it be a Texture of *Fibres*, *Veins*, or *Glands*; or if it is not rather produced from a *viscous* Matter, the which transpiring through the *Pores* of the *Bark*, is afterwards condensed by the Air, like hot Broth, which being exposed to the Cold, its Surface becomes

covered with a *Skin*; and there is no difficulty to agree with this Opinion, if we examine the Hardness, the *Crevices*, and Roughness of the *Barks* of *Trees*; however, the first Opinion is more conformable to Nature; and if we examine more carefully the Structure of that *Skin*, we may therein plainly see the Order of the *Fibres*, and even the *Pores* themselves, which are every where distributed with a perfect Oeconomy, affording a very pleasant Aspect, and may give us room to believe that those *Pores*, so wonderfully dispos'd, cannot depend on the Air alone.

After that comes the *Skin* or *Bark*, which is found immediately under the first Covering; this encompasses the whole *Tree*, as well in its Parts above as under the Earth; it consists of abundance of very strong and nervous *Fibres*, in which are found many *Veins*, *Sap-Vessels* and *Glands*, placed here and there; on the exterior Part there are also found several *Pores* of different Sizes.

After the *Bark* follows a Substance, which is the next to the *Stem*, and may well be called the *Peritonæum*, because it covers it entirely. Within it is very even and soft, and commonly moist and slippery, being mark'd sometimes with great and small Holes, through which the little *Branches* proceed from the *Stem*. The Use of this *Skin* is, that it preserves and protects the inward Parts.

At length, having described in a few Words the principal Parts of a *Tree*, as well the Externals as Internals, I shall now say something of *Blossoms* and *Fruits*, before I enter upon another Discourse; for before the *Blossoms* appear fully perfected, we may observe the *Foot-stalk* with its *Bud* shooting forth from the *Branch*: This indeed seems but an inconsiderable thing to the Eye; but upon Enquiry it affords matter of Admiration; for in this little *Stalk* all the *Vessels* through which the nourishing *Sap* is convey'd to the several Parts, are contain'd in a Bundle,
and

and when it grows thicker, its Substance swells and dilates it self, and gives the Shape or Form to the *Fruit*. Sometimes it presents its self under the *Blossom* like a Cup, and sometimes like half a Globe; and this is the Foundation of the *Blossoms* upon which their Parts are fix'd, and are likewise preserved and nourish'd by it. On this part the finest and purest *Leaves* or *Petals* are formed, which are commonly stained with *White*, *Red*, and other Colours; they seem to be fill'd with a kind of *Dew*, or with the purest *Sap* of the *Tree*, and are composed of tender *Veins*, and small *Tubes*. This pure *Sap* of the *Petals* is the *Spirit* or fecundating *Liquor*, by which a new *Fœtus* is engendred, and being enclosed in the *Seed*, is kept there for future Growth. As soon as this dewy *Sap* is refined in those *Flower-Leaves*, and impregnated by the universal *Spirit*, it returns towards the *Vesicule*, which may rightly be called the *Uterus*, because the *Fœtus* is there enclos'd. Besides the *Petals*, there are yet found in the *Flower* the *Stamina*, with their *Apices*, which are sometimes as fine as Threads; the last of which seem to be covered with Dust; these serve for an Apartment or Room to enclose the *Fruit* till it comes to grow. Before we finish this Chapter, we must examine if every Vegetable Being must necessarily have a *Root* to promote its Growth.

As we are now going to treat of the coming forth of the *Root*, we are to enquire whether every Vegetable Being must have necessarily a *Root* to promote its Growth. This is what *Theophrastus* affirms; but *Dioscorides* denies, and believes there are certain Things which live and grow without *Roots*, drawing their Nourishment only from the Air; but he alledges no Example: If perhaps he means the *Moss* of *Trees*, *Mushrooms*, the *Malabratrum*, and *Truffles*, he may have some Reason on his side. In truth, I was almost perswaded, that the *Moss* which grows on such *Branches* as are half rotten, and upon the *Bark* of *Trees* and *Shrubs*, had no *Roots*; but to be informed of

the Truth of it, for my own Satisfaction, I carefully examined all sorts of *Moss*, as well that of *Oak* as what grows upon the *Sloe-Tree*, and also some of the *Fungous* Tribe; and I found, to my great Satisfaction, upon a small *Branch* of a *Sloe-Tree*, which was half rotten, a young *Plant* of *Moss* sprouting forth its tender *Shoots*, like fine *Hairs* curling into one another, which was very agreeable to the Eye, as it is represented in Fig. II. N^o 1. This was different from the other *Mosses*, as well in its Shape as Colour; this being yellow, and the others very white: For on the contrary, the *Moss* which appeared whitish was full of *Branche*s, and sprung out for the most part from the *Bark*. See N^o 2. At the thickest End of the *Tree* I discovered another sort of *Moss*, which encompassed the *Stem*, and spread it self on all sides towards the Top. This sort was of a fair *White* without, but *Black* within, N^o 3. I took it from the *Bark*, and examining it very close, I discover'd several small *Roots* like small *Bristles*; but as my Sight was too weak to satisfy my self, I made use of a *Microscope*, and then I saw plainly there were hundreds of *Roots*, which together lookt not unlike Velvet; some were longer than others, according to the Proportion (as I suppose) of the Resistance they found in entering into the Parts of the *Tree*, in whose *Pores* the *Moss* had fixed it self, and from whence it drew Substance and Nourishment; see N^o 4 and 5. I concluded from hence, that since the *Sloe-Tree*, which was half rotten, and cover'd with *Moss*, was yet upon its natural *Root*, this *Moss* must necessarily have been produced from the putrid *Sap*, and sickly *Spirits* of the *Tree*, as was that likewise which grew upon the little *Twigs*, N^o 2. And tho' the *Mosses* N^o 3, 4, 5, did not grow so well as the other, which was fixed immediately to the *Bark*; it is easy to give a Reason for it, which is, because it was, as one may say, out of its Centre, *i. e.* it was not so closely united with the inferiour Parts of the *Tree*. As to *Mushrooms*, which the *Latins* call *Terrigenæ*, Sons of the Earth, or

or something which the Earth produces of her self, their Figures are different; some are like Straw-hats, such as the *Suabian Boors*, or *Peasants* in *Germany* use, N^o 6. others resemble an *Umbrella*, N^o 7. others are not unlike *Snuffers*, N^o 8. others represent the Figure of an *English Cap*, N^o 9. They grow in different Soils, some in *Marshey Grounds*, others in plain *Fields*, N^o 10. and these are the best, as *Horace* said,

*Pratensibus optima fungis
Natura est, aliis male creditur.*

that is to say, The *Mushrooms* that grow in *Meadows* are the wholesomest, and we must not trust too much to the rest. There are some found likewise on the *Roots* of rotten *Wood*, and upon *Trees*, N^o 11. and others on *Stones*. It appears by the following Verse of *Martial*, how *Mushrooms* were esteem'd by the *Romans*,

*Argentum atque aurum facile est,
Lanamque, togamque, mittere, Boletos mittere difficile est.*

that is, We may easily send to our Friends *Gold*, *Silver*, *Stuff*, *Wool*, and *Robes*, but *Mushrooms* are not always to be found: And as *Claudius* died by eating some of those *Mushrooms*, and was deified after his Death, *Nero* said wittily upon this Matter, that *Mushrooms* were certainly the Food of the Gods. But as to the Question, Whether they have any *Roots* or no? I answer, that all those which are upon *Trees* and rotten *Branches* are without *Roots*; but those which grow in wet and *marshy Grounds* have *Roots*, striking into a kind of rotten *Earth*, N^o 12. but these *Roots* are hardly join'd to the *Mushrooms*; some indeed have small *Roots* fix'd to the bottom of their *Stalks*, N^o 13.

The *Lens Palustris*, which grows and swims upon standing *Waters*, which *Ducks* and *Geese* feed eagerly upon, and is there-

therefore call'd *Ducks-Meat*, deserves to employ our Curiosity for a Moment. This sort of *Plant* resembles a green *Moss*, having very small round *Leaves* like *Lentiles*, some of which are big, and others small, having, instead of *Roots*, small *Fibres* like Hairs: These *Plants*, in the Month of *June*, put forth under their *Leaves* small round Bladders, in which the *Seed* is contained, as in N^o 14. and if we plant them in Earth, those *Fibres* strike *Root*, and produce a *Plant* perfectly like *Cresses*. As to the *Truffles*, several Authors have shewn that they have *Roots*, therefore I need not say any more of them. There are several Persons that tell us, suppose those *Plants* had *Roots*, yet nevertheless it is plain that the little *Branches* of a *Willow-tree*, and some others; as also those *Buds* which are applied to the *Branches* of *Trees* by Inoculation, and the *Slips* that are planted in the Ground, it is, I say, evident, that all these grow, tho' they have no *Roots*; from whence it appears that some Things can grow without *Roots*; but I answer that, first, it must be allowed, that a young *Branch* or *Sprig* that is put in the Ground without a *Root*, is not without some fresh *Sap* in it, which preserves the Motion of Fermentation, and wherein is found a certain Portion of the Vegetative Principle, which as it is naturally dispos'd to maintain or keep up its Force, or to augment it, thence it proceeds that there comes towards the Bottom a Hardness, or *Callus*, which is a thick congealed *Juice* or *Sap*, and this being there, it draws instead of the *Root* the Moisture to it self, while the same Matter also produces a *Root*, as we shall more amply demonstrate in another place; for without such a coagulated Matter, it is impossible that a *Tree* could be of long Durance, since it would die by little and little. It is the same with engrafted *Branches* and *Slips* set in the Ground, which could never grow without this hardned Matter, as is deduced in all its Circumstances in the Chapter where we treat of the Vegetation of the *Roots* of *Trees*.

Explanation of the Cuts, or Table II and III.

The II represents, 1st. a Branch of a wild Plumb, or Sloe-Tree; the 2d. some Mushrooms; and in the last place, that Verdure which swims upon the Waters, call'd Lens Palustris, or Duck-Meat.

N° 1. 1. 1. 1. *Is the tender Moss, growing upon the little Branches of the wild Plumb-tree, half rotten; but is here and there to be seen in other Places.*

N° 2. 2. 2. *How Moss grows likewise upon the Side-Branches; but much whiter, larger, and curled, being almost like Wool.*

N° 3. 3. *How the Moss that appears upon the Bark, and covers the whole Stem or Trunk, does not grow out of the Stem, but is tenderly fastned to its Surface.*

N° 4. *Part of the Moss which was taken from the Stem, and how it presented it self on one side quite white, and curled.*

N° 5. *How the Moss, which was taken from off the Bark, appeared quite black, and hairy, on the Back or Inside; which Blackness proceeded from a numberless Quantity of great and small Roots that draw the Sap out of the Bark.*

Of MUSHROOMS.

N° 6. *Mushrooms that grow between Rocks, and are of the Figure of a Straw-hat.*

N° 7. *Mushrooms that have the Form of an Umbrella, such as Ladies carry to keep off the Heat of the Sun and Air.*

N° 8. *Mushrooms that grow on rotten Wood, and about the Roots of Trees, resembling in some manner the Tuiaux of Candles and Snuffers.*

N° 9. *Mushrooms like an English Cap.*

N° 10. *The best Mushrooms, which grow in marshy Ground.*

N° 11. *Mush-*

N° 11. Mushrooms, which have their Roots in rotten Ground, in which they spread very far.

N° 12. The Root of the foregoing Mushroom spreading it self in the rotten Earth.

N° 13. Mushrooms, which have very small Roots.

Of the LENS PALUSTRIS, or DUCK-MEAT.

N° 14. How this Herb spreads it self, like Moss, upon the Surface of stagnating and still Waters; and how it becomes another Herb when it's planted in the Earth; how in the Month of June there grow under the Leaves of this Verdure small Bladders, in which is found the Seed; and also this Figure represents a great quantity of small Roots proceeding from this Plant.

T A B L E the Third.

The third Table shews us the Germination of a Peach (Stone), with its Parts and Shootings.

Fig. I. How the Root comes forth first by a little Overture in the Nut.

Fig II. How the Kernel shoots forth its Germe or Plume towards the Top; and how the chief Root forms it self, and the small Roots or Fibres on the side of it.

Fig. III. How the Root extends it self; from whence we may learn, that a Shrub has almost as many little Roots as Leaves; (a a) the hard Shells; (b b) the Ear-Leaves; (c c) the joining of the Stem with the Root.

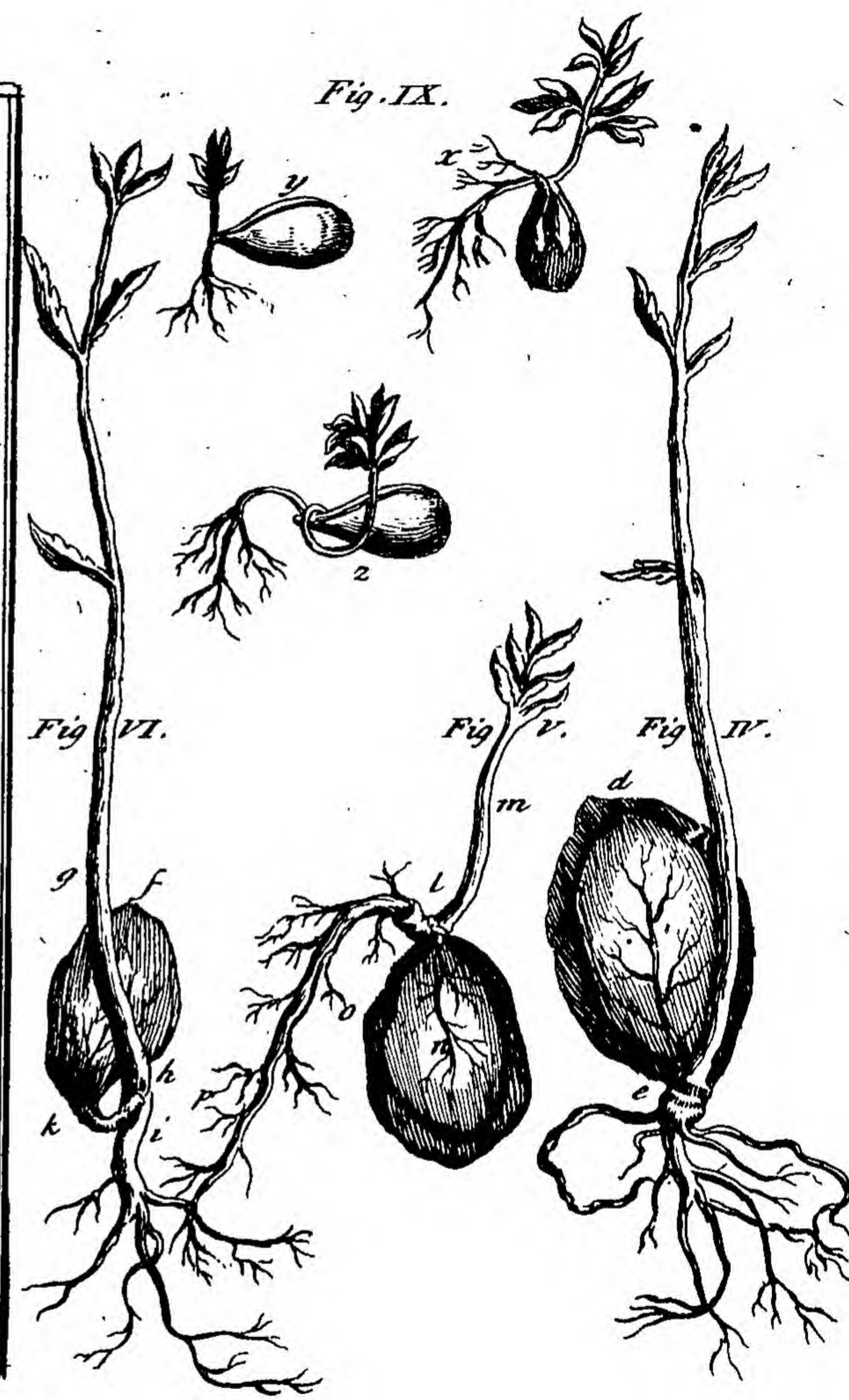
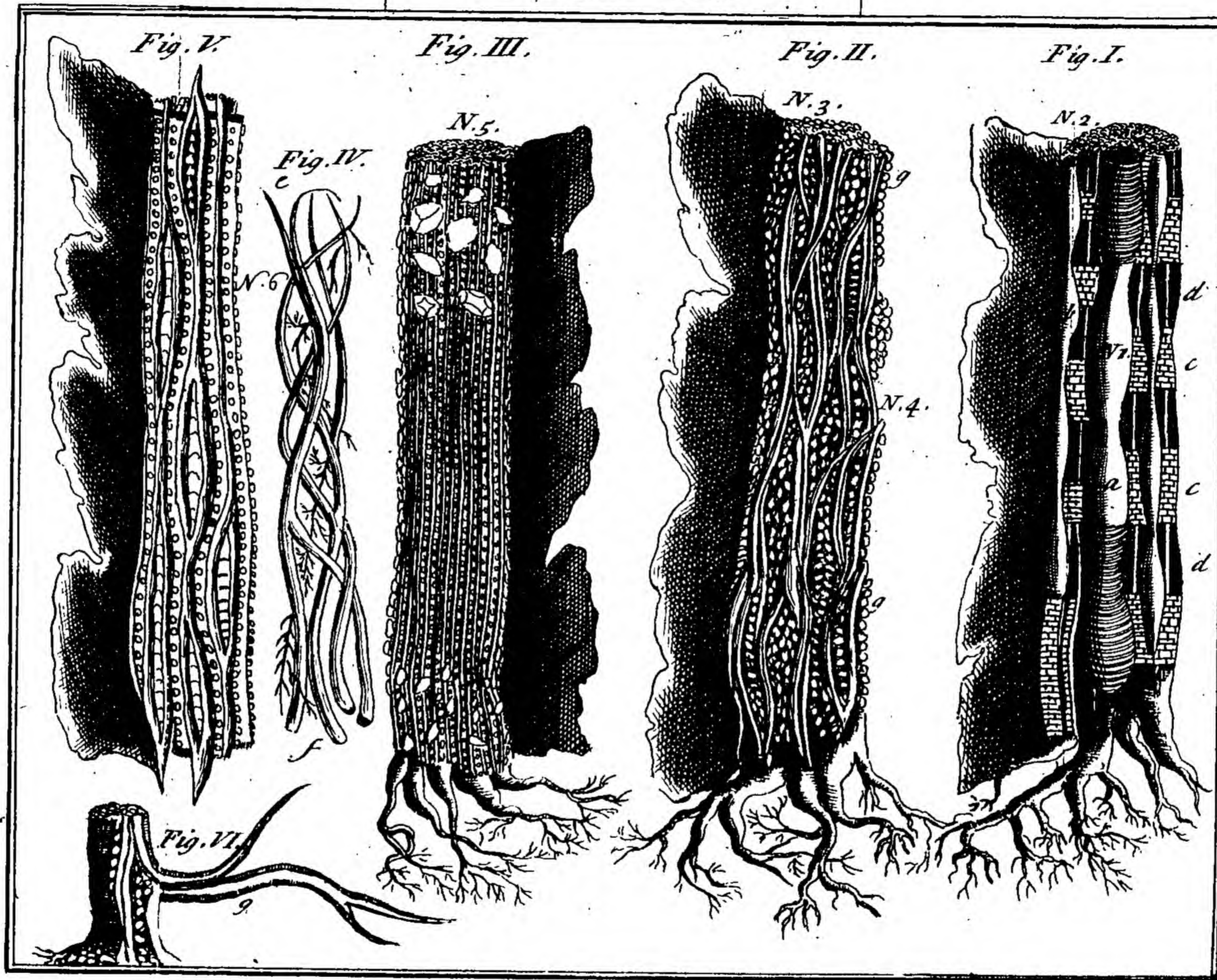
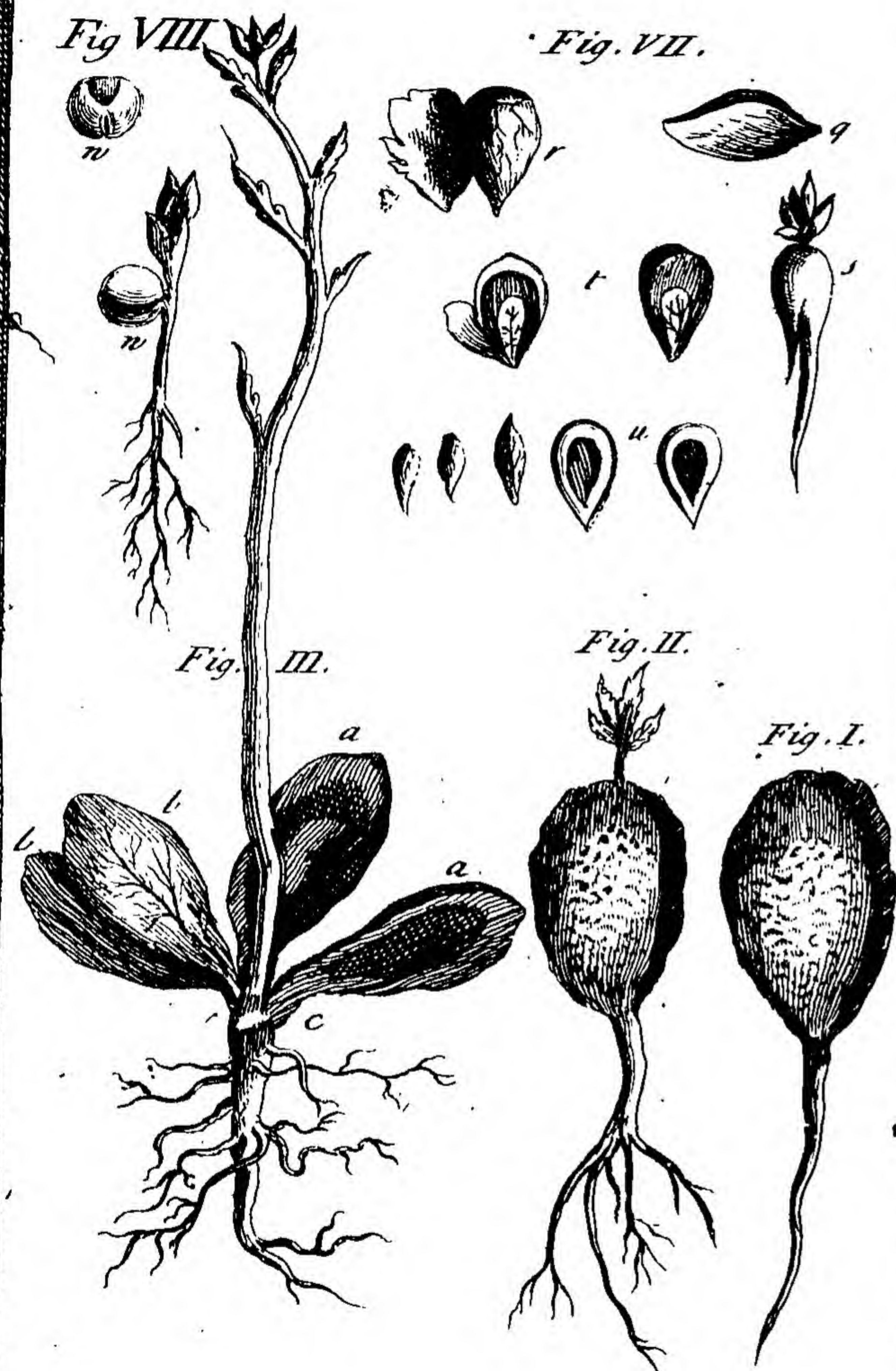
Fig. IV. Shews how the Stem grows streight and upright (d), as also its close Connection with the Root (e); and how the two first Leaves or Ear-Leaves contribute to its Growth.

Fig. V. How the Heedlesness or Ignorance in planting the Seed upside-down, hinders the growing of a Tree: (l) The Union of the Stem with the Root which appears obliquely: (m) The
Sinn-

Plate III

Plate III p:34

Plate III



Sinuosity of the Stem: (n) The first Leaf being half dead in the Ground, cannot sufficiently therefore furnish the Stem with Nourishment, because of the straining of its Vessels by its Crookedness: (o) The hard Shell, in which the first Leaf is still preserved: (p) The Root which has received more Nourishment from the first Leaf than the Stem, and is grown for that Reason much longer, though a little crooked.

Fig. VI. Opens to us the following Observation: (f) Is a part of the first Leaf: (g g g) How a little Tree being split from top to bottom, we may easily discern the Pith from the Top of the Tree to the Extremity of the Root, and the Connection of one with the other; and there are likewise to be observed other fibrous Parts: (h) The Knot, wherein is to be seen the Basen (i), like a little Spot (k), which is the Point that marks out the Abode of the Vegetable Soul, and may be called the Pineal Gland.

Fig. VII. Several sorts of Seeds of Lemmons and Oranges; (q) How Gardeners, for want of Skill to distinguish which is the upper or lower part of the Seed, lay the Stones or Seeds on their sides to prevent Mistakes: (r) Is a Lemmon Kernel, or Seed opened, and represents the Coat or Covering of its Matrix, which denotes also the upper Part, and must be set upwards: (s) How the Lemmon Seed shoots a double Root, which is something remarkable, and is seldom seen in any other Plants: (t) How the Seed being anatomiz'd, consists of five Parts, (u) which shews us the Reason why the Stems of Lemmon and Orange-Trees are not round.

Fig. VIII. Is a Pea resembling an Hermaphrodite, where we may observe both the Masculine and Feminine Sex, and (w) shews its Bark, and how strongly it sprouts.

Fig. IX. Several Vegetations of Seeds planted unequally: (x) How the Point is upright, but represents a cross Growth: (y) How the Crown or Plume of an Orange Kernel planted upon the Side, grew in a strait Line: (z) Another Lemmon Seed that likewise was set upon the Side with its Crown or Plume grown

downwards, and the Difficulty it had to turn upwards. Here we may observe what Pains the Root has taken, to recover its Situation as it ought to be.

Explanation of the Figure annexed.

Fig. I. Represents a young Oak, as it is observed by the help of a Microscope. After having taken off the upper Parts, we perceive a very large Pipe or Conduit (a), almost of the Shape of the Stomach of a Fish, together with the Entrails or Bowels, which with its Partitions towards the Bottom and in the Middle resembles the Oesophagus, being shut up and surrounded with several nervous Membranes, which hinder the Sap that rises from coming down again. (b) Represents the small Viscera; but I have not yet had time enough to examine them as I ought, I leave them at present to be considered by the Curious. (cc) Seems to be the Rescau in which the Sap of the Viscera divides it self and circulates. (dd) Are the Veins that serve to convey the Sap, which are also accompanied with Sinews.

Fig. II. After having separated or cut off the former Part, I observed what follows; I take what is represented by (g), and (N^o 3 and 4.) for the Lymphatick Vessels. However, I perceived on all sides here and there several round white Spots; which I take to be Glands cut in pieces, which perhaps may have close Union with the Lymphatick Vessels.

Fig. III. Coming near to the Pith, we made the following Observation, as N^o 5. I hardly know my self what Name to give those Spots, which particularly present themselves in this Figure; but as it is well known that there are found in an Animal Body large Glands, as well as small ones: I take these for the largest sort. The rest appeared to be Veins and Sinews mixt with small Points, seemingly caus'd by the cutting asunder all sorts of Vessels.

Fig. IV.

Fig. IV. Represents the Vessels which convey the Sap forward and backward; those which carry up the Sap are large towards the Bottom, and grow gradually narrower, as (f), and those that send back the Sap (e), are narrow towards the Beginning, and afterwards enlarge themselves; the first raise the Sap, and the others carry it down.

Fig. V. This Figure represents the Parts which approach the Pith, as they are seen by the Microscope, as N^o 6. I suppose this to contain some of the Lymphatick Vessels cut to pieces, with their Valvulas; also there was the Appearance of Glands and Sinews like what we find in the ligneous Substance, the which fill'd up the Interstices of the Pith.

Fig. VI. Shews the Union of the Stem with the Branches, as also all the Veins, Sinews, &c. dispers'd here and there, as in (e).

CHAP. IV.

Of those JUICES which give Life and Nourishment to the TREE, as well when it is in the SEED, as when it is in its growing State.

TH O' the Seed of a Tree, while it is not impregnated, has no Power of Vegetation, yet since the Embryo of a Tree, even before 'tis fertiliz'd, is fed or maintain'd, it may easily be concluded, that this cannot be without a nourishing Sap. Now of this the Seed has sufficient in it self to supply it till 'tis fertiliz'd or

hatch'd in the Bowels of the Earth; but if it remains too long out of the Ground, the *Sap* consumes and dries up, the *Seed-bud* is spoiled, and becomes unfit for Vegetation. But as soon as the *Seed-bud* or *Plantula* begin to vegetate, by means of the vegetative Principle, then it begins to draw Nourishment, and grow vigorously. This internal and hidden Operation proceeds from nothing else but the Reception of the nourishing *Sap*, which acts by the Power and Direction of the inward Mover, as well by Digestion as Fermentation, by which means the Parts of the *Sap* being fix'd receive their Confirmation; and if I may so say, an Uniformity of Composition, which we may call here their Proportion.

The Nourishment and Growth of a *Tree* consists in a regular and uniform Reception of the nourishing *Juice*: The *Root*, which is as the Mouth of a *Tree*, draws the *Sap* or *Juice* from the Earth, and conveys it to the *Trunk*, where it enters the *Cavities* or *Oesophagus* and *Entrails* of the *Tree*: When it is there sufficiently digested, it distributes it self by the different *Veins* into all the Parts. From this *Sap* the *Glands*, *Lymphatick Vessels*, and the *Nerves*, draw to themselves such Nourishment as they respectively require, while the Remainder returns back to the other Parts. Now since the most subtle and purest *Juice* is found in the *Nerves*, and these are the most conveniently plac'd for nourishing the other Parts, therefore all the other Parts are adjusted and proportion'd to them, as might be demonstrated, if there was occasion.

We may easily comprehend from hence what is properly the nourishing *Sap* of a *Tree*, and in what it consists; Chymistry has sufficiently discover'd to us that Secret, *i.e.* that as a *Heterogenous Juice*, it is compos'd of divers Things, such as Parts which are *Aqueous*, *Saline*, *Sulphureous*, *Aromatick*, and *Terrene*. Now these Particles are proportioned and mix'd one with another after different Manners, and combin'd so variously, as not
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to be describ'd. Although every *Tree* has in its self something of those Parts which we have just now mentioned, yet from their particular Natures, and the different Modification of their Bodies, one has occasion for more, another for less of this or that; so that in general we find vast variety of Mixtures: For a *Tree*, which is of a *watery* Disposition requires a Soil of the same Nature, that it may draw abundance of Moisture, otherwise it will not thrive. If another of a *dry* Constitution, full of *Sulphureous*, *Oliaginous* and *Balsamick* Parts, is planted in such Ground as abounds with such like Parts; it does not only draw great Quantities of them to its self for its Nourishment, but grows and prospers in proportion. If on the contrary a *Tree* has more *saline* Parts, and requires Particles of *Volatile Salts*, it must necessarily draw them from the Earth to grow and prosper as it ought. We must own that the *Rains* are full of these Parts; so that what the Earth has not of her self, she acquires by their Means; but Art may contribute greatly to help the Deficiencies of the Earth, either by *Water*, *Litter*, *Pidgeons-Dung*, *Salt*, *Sulphur*, *Chalk*, or such other Things as it has not of it self.

It is impossible to express or even conceive how Plants draw their Nourishment, and how that is digested, because it is performed by an interior Movement. All that we can say of it is, that this Operation is made by a certain Arrangement of the nourishing *Sap* which disposes it self into the solid Parts, by running into their *Pores*, and by the *Interstices* which are among them; so that one part takes place above, and another underneath. The Sun, Moon and Stars greatly contribute, and also the Air and subterraneous Heat are equally assisting to Vegetation, as it has been amply proved by others; for by this Means the *saline*, *sulphureous* and *aqueous* Parts are rarefied and disposed to Fermentation, and the Separation of the *Juices* is made by certain Organs appointed for that purpose. I am not satisfied whether we should make any particular Distinction between the Nutrition and Growth.

Growth of a *Tree*; perhaps in its Growth the *Sap* is drawn and distributed in greater abundance than when it supplies it self only with *Sap* for its Nourishment, and then the *Vessels* dilate and are more extended, and swell the *Tree*, till it has attained to its full Extent either of Height or Thickness; for at the Creation God prescribed certain Bounds or Periods of Growth to the vegetative *Spirit*, and mark'd out even the Point of Height, Breadth and Thickness, beyond which no *Plant* could attain; for if a *Tree* was to grow every Year with the same Force and Vigour that it did at the Beginning, in a hundred Years it would be higher than the Tower of *Babel*; and if its Thickness was likewise to encrease annually as it did at first, we might in time build Castles and Houses upon its *Branches*, and from such an exorbitant Height and Thickness would result such Deformity and Disorder as is more easy to imagine than express; therefore God, by his infinite Wisdom, and incomprehensible Power, has establish'd an exact Symmetry among all the Beings which are created, and has assigned to each *Tree* a just Proportion, which it cannot exceed.

Although it is certain that a *Tree* must have Nourishment for its Maintenance as long as it lives, yet nevertheless we find that it does not grow all that time, but is at a stand when it has once attain'd to that Period, which Nature has fix'd for its Encrease. When a *Tree* has been a long time in the Earth, its *Vessels* and stringy Parts, which were at the Beginning very free and tender, become by a Succession of Time thick and hardned, and cannot any more dilate themselves. The *Bark*, which at first is thin and tender, becomes by little and little so hard and compact, that the tender *Vessels* and other Parts which it encloses, cannot possibly force it to dilate it self; such is the Disposition of the external and internal Parts of a *Tree*: But the reason why one *Tree* or *Plant* grows quicker than another, as do the *Willows*, *Peach-Trees*, and also the *Vines*, which shoot so quick that one may almost see them grow; whereas on the other hand the *Sap-*
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pings, Oaks, the *Nestlers*, and such like vegetate more slowly: The Reason, I say, of this Difference is not from any interiour Vice in the *Trees*, or from any want of nutritious *Juice*; or that the Earth furnishes a greater Quantity of *Sap* to those which are quick Growers, but rather from a certain Modification or Disposition of their *Pores*, and of their Structure, or else from a certain Arrangement, or a certain natural Proportion of the Parts join'd together; for the Parts which have long large *Fibres*, are not only with greater Ease separated from one another, but receiving into their *Cavities* a greater Quantity of *Sap*, they are more easily nourish'd and extended, or enlarg'd. On the other hand, the *Sap* has a much slower Motion in those *Plants* with compact *Pores* and *Fibres*, because it cannot enter them so readily; and also finding it self straitly press'd in one or another of these Parts, it is embarrass'd in such a manner, that the Circulation must of necessity be much slower than in the first, which have their Parts more free and open; besides, as the *Sap* does not rise in so great Quantity, they are more subject to Corruption than the others.

As we have here treated of the *Growth* of *Trees*, we may in the next place enquire why the *Trees* of the Plain grow better than those upon Heighths and Mountains: To which we may answer,

First, Because low Ground is commonly spungy, and attracts a great Quantity of Moisture; and by reason of its Softness and Porosity preserves it a long while.

Secondly, Because *Trees* of the *Plain* are in themselves by their Nature and Structure much softer, more flexible and tender, and their *Pores* being more open than those which grow upon Heighths, they have consequently need of more of the nutritive Juice, which as they find out and imbibe more abundantly, they accordingly have a quicker and better Growth than a *Tree* of the same kind would have being planted on a Mountain; for 'tis well known that high and stony Grounds are not so moist

moist as the low Lands; for let the Rain be never so plentiful on the Mountain, it soon finds a way to the Bottom: Besides, Moisture cannot so easily penetrate among Rocks as in the softer Earth. 'Tis for this reason that *Trees* grow not so readily, nor so well upon Mountains and Heighths. 'Tis remarkable, on the contrary, in *Trees*, which grow on Mountains and Rocks, that their *Fruits* are firmer, more durable, more aromatick, and of better Taste, than those which grow in plain and low Ground; and this is not a little help'd by that subtle and volatile *Mineral Spirit*, whose *metallic Particles* evaporating, rise and insinuate themselves into the *Trees*, and by mixing themselves with the nutritive *Juices*, thereby communicate to them their Virtue. Thus we easily find the Reason why *Trees* which grow wild, and those of the Woods and Plains, are much livelier, fresher, more sound, more lasting, blossom more abundantly, and produce more *Fruit*, than such as are planted and cultivated in *Gardens*, because it is easy to comprehend that these latter are of a very tender and delicate Contexture; and that because they draw too much Humidity with the nourishing *Juice*. For we see that most Owners of Nurseries and Orchards think they cannot be too indulgent to their *Plants*; they dung them every Year, and omit no Care for their Growth; hereby indeed they attain partly their End; but at the same time are the Occasion that their *Trees* become too tender to bear the Severities of Cold and Changes of Weather, and so become stunted in their Growth, fading by little and little, and at length come to a slow and languishing Death. For, in this, *Trees* are like Children, who being too much fondled in their Youth, and bred too delicately up, are unable afterwards to support the Inconveniencies of Heat and Cold; they are ever exposed to infinite Accidents, always weak and infirm, and subject to numberless Inconveniencies. 'Tis surprising to observe the Tenderness of the *Blossoms* and *Fruits* [of these little *Garden Trees*; for if it rains but a little too much the *Flower* falls; if a *Caterpillar*

terpillar goes over its delicate *Fruit* it rots. Whereas wild *Trees* are of another Constitution; for though they draw but little Nourishment from the Bosom of the Earth, nevertheless their *Fibres* become much harder, thicker, and more durable; they strike their *Root* further into the Earth, and draw from thence greater Quantities of the nourishing *Juices*, which renders them not only larger and handsomer, but also better able to bear Cold and Heat, and the sharp and piercing Winds: They endure all Weathers; grow much faster; their *Blossoms* are more lasting, and their *Fruit* incomparably firmer, more healthy, and in greater plenty than the *Fruit* of those which are so carefully cultivated in *Gardens*. This we see in the *Trees* of Country People, who use them as they do their Children, whom they bring up with homely coarse Diet, and expose them, half naked, to the Wind and the Rain in Winter as well as Summer; and yet nevertheless we generally see them much handsomer and wholsomer than Children which have a Town Education. It would employ a great deal of time to examine the several Constitutions of different *Blossoms*, of which some opening in the Morning are fine and beautiful, and at Night faded and dead; whereas another fine *Blossom* shall remain fresh and lively eight Days, or more: As also to enquire why some *Plants* live but two or three Years, whilst others endure more than a hundred. But we shall refer this Matter to the second Part, where probably we may treat of it more exactly, because we shall then be able to employ more time in it than can be allow'd now.

§ 7. Before I close this Chapter, I shall propose this Question; Why most *Trees* lose their *Leaves* in Winter, and do not grow at that time as well as in Summer; though *Leaves* are as it were the *Hair* of *Trees*, and as much their Ornament, as the *Wool* is of the *Sheep*, of which, at that Season, because of the Cold, they have as much need as Men of their Cloaths; and the common Proverb being generally true, that *what is good for the*
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Heat, is good for the Cold too? But 'tis a thing well known, that few *Trees* have a Superfluity of resinous and aromatic *Juice*. Now the *Nitre*, that predominates in the Air in Winter, cannot do much harm to those that partake much of the former; for it cannot well condense their *Juice* more than it is, it being already sufficiently coagulated; but the nitrous Spirit can operate more strongly upon those which are composed of other Parts, by shutting their *Pores* and *Fibres*, which obliges the *Sap* to return from whence it came, and concenter it self: And since the *Tree* distributes most of its superfluous *Juice* among its *Leaves*; therefore at that time the *Juices* turn back and settle in the *Twigs*, in the large *Branches*, and especially in the *Root*, by which means the *Leaves* being depriv'd of *Sap*, fall of themselves and rot.

But they who are of Opinion, that in Winter there is neither *Sap*, nor Circulation of *Sap*, in the *Buds*, the *Sprigs* and large *Branches* of the *Tree*, are much mistaken: On the contrary, I say, there are then more *Juices*, and in a greater Abundance in those Parts, and the Circulation is quicker than in Summer; which I have experienced in a *Nut-tree*, when by cutting off a *Branch* the last hard Winter, there came out a great deal of Water, which does not happen in the Summer. Our Reason explains this, without having recourse to Experiments; especially if we examine the Constitution of our Bodies, in Winter every one will find himself more active than in Summer; he'll find himself to have a better Appetite, and his Stomach to digest his Victuals better: The Blood circulates more freely, and the vital Spirits are more Volatile, and one is more alert and vigorous. The Reason of this, without doubt, is because by means of the Cold the *Pores* are closer shut than in the warm Season, and the Humours as well as the vital Spirits are then assembled in a greater Abundance. It is probably the same, in regard to the Constitution of *Trees*, in Winter, the *Pores* being more closed, and the *Fibres* more strictly press'd together. Now since this proceeds
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from the Cold, it is easy to judge that the interiour Motion, or intestine Fermentation ought to be so much the stronger: For if this internal Motion did not beget a Heat sufficient to resist the outward Cold, this would soon get the Mastery, and hinder the internal Motion; which Hindrance would be immediately succeeded by a Stagnation, and this followed by a Dryness, which would end at length in a total Extinction; as many Lovers of *Gardening* found in that long and severe Winter, to their great Displeasure. This especially happens when the interiour Parts are not in a Condition to resist the Force of the external Cold.

§ 8. I shall moreover add my Thoughts upon another Thing; for as much as it appears very particular and surprising to us, when we are told that Water flows upward, or against the Hill: This indeed is no inconsiderable Matter, and well deserves to be enquir'd into and explained, to the end that we may know how the *Aliment* and nutritive *Sap* rises of it self to the Top of the *Tree*, without the help, if I may so speak, of any Engine. It would be too tedious to enquire whether this proceeds purely from Fermentation and continual Motion, or from the Elasticity and Pressure of the Air, or whether it is owing to the particular Structure of the *Veins* and other Parts; I shall only say it is perform'd as follows. We have shewn in the first Chapter that there is resident in *Trees* a certain vegetative Spring, which may be called the *Architectonic Spirit*; for indeed it does the Business of an Architect.

The third Chapter has shewn the Configuration of the interiour Parts of the *Tree*, and how wonderful its Structure is. In this we have not only treated of the vital *Juices*, and of the Parts of which they consist, but have also shewn how they are carried to so extraordinary a Heighth, and brought afterwards down again: But if it be expected I should demonstrate this from the Principles of Physicks, 'twill be necessary to insert a small System of the *Sky* and the *Air*.

And first we must enquire wherein properly consists the Difference between the *Sky* and *Air*. To which I answer, that they differ only accidentally, for the *Sky* comprehends and surrounds all. Now as an incredible Quantity of different Vapours are continually exhal'd and drawn up from the Earth and Water, and are composed of *Particles* which differ infinitely one from another; a certain Space of *Sky* is filled with these heterogenous *Particles*. This we may observe in the *Atmosphere*, which is a certain Extent surrounding the Earth, wherein we find an infinite Number of *Atoms*, or little *Corpuscula*. If it was not for these Exhalations, there would be no *Air*; for instead of the *Air*, there would be nothing but the *Sky* or *Æther*, which is no less durable than the Firmament it self. Now tho' the *Ætherial* Matter be in the *Air*, yet the *Air* is to be consider'd only as an Accident, being caus'd merely by the Interspersion of so many Exhalations arising from the Earth. The *Air* then is a light Substance, invisible, transparent, fluid, moveable, and compress'd in it self, being sometimes lighter, sometimes heavier, sometimes insinuating it self into the porous Parts, and sometimes forced out of them. It is useful to the Growth of the *Tree*, as likewise of all other living Bodies, and is one of its chief Necessaries, as will appear by the Sequel.

§ 10. Now since this is not known, or easily understood by every Body, it may seem like talking at random, without being able to prove what we assert. For who would think that our *Atmosphere*, or the *Air* we breathe, should consist of *Particles* that are *aqueous*, *terrestrial*, *saline*, *sulphureous*, *lucid*, *igneous*, *putrid*, &c?

I shall not appeal here to a multitude of Experiments, since 'tis a Matter that falls under the Perception of our Senses. For as to the Sight, we cannot indeed see the *Air*; but when the Sun pierces strongly through a Window into a Chamber, we then discover the *Corpuscula* or *Atoms*, and their surprising Motion

tion in the Sun-beams. Besides, we often perceive very distinctly how the Sun draws the aqueous Parts, which being mixed with Parts of a different Nature, compose the Clouds, and are the Cause of Lightning, Rain, Fogs, &c. which being visible Things, may serve as a Demonstration of others that are invisible. But it does not follow that the Sight alone is to decide all Things, since we may also discover a great many hidden Things by our other Senses; and it is certain that the Touch is a very good Instructor. For Example, when we clap one Hand in t'other, each feels something moist between them; or when one opens or shuts a Door suddenly, that Motion causes the *Air* to be more sensibly felt, than when agitated by a Lady's Fan.

As to the *Ear*, it is also a competent Judge of the *Air*; for the more this is shaken, the stronger Impression that receives: Whether this Motion be caused by firing a Gun, or otherwise, it is sufficient to our Purpose, that the Drum of the *Ear*, and the other dependent Parts feel it; which they often do to such a degree, that one is forced to say I cannot bear this violent Motion of the *Air* in my *Ear*. But if we were inclin'd to appeal to Experiments, to prove that the *Air* may be felt, we should need only to mention a few of many. 'Twill be sufficient to examine a Candle, or the Fire, why they burn: Or we may consider what happens when we draw the *Air* out of any Vessel by the Air-Pump; for as soon as it is suffer'd to return, the Sound and Noise it makes is sufficiently heard. Let us also examine Fountains and Hydraulick Instruments; one need only pump into such a Machine more *Air* than it can contain, or than it has need of, and it shall force it self out again with Impetuosity and Noise. Being upon this Subject, I remember a fine Experiment I saw made in *Holland*

It was this, They placed on the Pneumatic Engine, as usual, a Bell or Bottle, a third part full of Water; then they drew out the *Air* by little and little; upon this the Water began to bubble,

ble, to rise, and to boil, as if it had been over a great Fire; and if they had not given over pumping the *Air*, the Recipient would have broke in a thousand pieces.

They made a like Experiment with a Hog's Bladder; into the same Recipient they put a Bladder unblown, and tied; as soon as they began to draw the *Air*, the Bladder swelled of it self as strongly as if one had blown it with one's Mouth, which is a sufficient Proof of the Rarefaction and Elasticity of the *Air*. As to what further regards the Pressure and Temperature of the *Air*, that is explain'd by the *Barometer*. But whoever would be more particularly inform'd, may read *Senguerd. Phil. Nat. Pretowing de rarefactione Aeris in Act. erudit. Lips. Anno 86. Sturmii Colleg. curios. &c.*

§ 11. Besides, it cannot be denied, that the *Æther* and the *Air* fill and move all Things in all corporeal Substances, whether on the Earth, or under it, and have a perfect Affinity one with the other. They are above all very active in regard to Objects which have need of a continual Motion of Fermentation, of Conservation, of Nutrition, and of Generation, as have, for Example, all Vegetables, and other living Bodies. The Cause from whence the *Air*, which is composed of so many heterogeneous *Particles*, has its sudden and continual Motion, is properly the *Æther*, or the subtile and celestial Matter, from which the *Corpuscula* in the *Air* acquire their Force and Motion: Besides, one part moves another by the same Means; and as is well known, the less the Bodies are, the more sudden is their Motion: This is done incessantly in the *Air*, tho' we cannot perceive it. When these Emanations gather themselves together, they form a visible and moveable Body, as we may see in the Clouds. Besides, the *Air* has also this Property in it self, that it can be easily contracted and dilated; it can separate, and reunite it self, and may be compress'd within the most minute Body; but does not fail of extending it self again on the first Occasion.

caſion. This is called the Preſſure of the *Air*, from whence reſult the Extension and Rarefaction as well as the Compreſſion of it, as may be ſeen by the aforementioned Experiment. By this means we may explain abundance of *Phænomena*, and eſpecially why Water ſhould riſe; for otherwiſe we muſt have recourſe to occult Qualities.

§ 12. Beſides, as we may well ſuppoſe that the Emanations which are in the *Air* are very light and ſubtile, ſo they find room every where, and give place to the greater; they are even drawn up towards the *Sky*, by reaſon of their Levity. But tho' theſe *Particles* are very light, they nevertheleſs have their Weight, according to their Proportion and Degree of Levity. I ſhall not now enter into an Explanation of Gravity and Levity, or of Humidity and Siccity, but will only ſhow how, by the help of the *Air*, the *Humours* or vital *Juices* of *Trees* may be driven up to the Top, when the *Organs* of the *Tree* are well diſpoſed.

We may at laſt conclude from what has been ſaid, that there is a Proportion of *Æther* in all *Liquors* and *aqueous* Things, by which means the *Air* is capable of penetrating the ſpongy and porous Parts, and of eaſily contracting it ſelf there, as well as of dilating it ſelf again. Suppoſe there was a *Tree* bigger than the Tower of the Town-houſe at *Ratisbon*, provided with its *Pipes* and *Conduits*, *Veſicles* and *Valves*, as that Tower is with its Stairs, it would, as was proved by what has been already ſaid, draw to it ſelf, through ſome narrow Paſſage, by means of the Quantity of its ſpongy *Roots*, the nutritive *Juice* of the Earth, as well as the *Æther*, which is likewiſe under the Earth; to which Operation the Preſſure of the *Atmoſphere* muſt contribute very much: For 'tis known that the *Filaments* of the *Root* grow bigger the nearer they come to the *Trunk*, as thoſe of the *Stock* grow leſs as they approach the upper Parts: By this means *Air* enters a larger Space; from whence it follows that it tends to dilate

late it self, but is oppos'd by the Bodies, which it resisting again, by this Action and Re-action the interior Motion is caus'd: And as the *Trunk* is nothing but a *Canal* consisting of lesser *Pipes*, the *Juices* are driven by these Motions towards the Top, and forced from a larger to a narrower Space, by the exterior Pressure of the *Atmosphere*; and that the *Juices* being forced up may not fall down again, there are *Valves* in those *Pipes* which hinder it from returning the same way; but when it has once got to the Top, then it returns by other *Vessels*, which we may call *Veins*. This is indeed a perpetual Motion, which surpasses all others; and if I had a Mind to go into the Search of a perpetual Motion, I would take my Principles from hence, because this is founded on Nature; but it is not my Study. In the mean time we have proved in some manner how the aqueous Humours may rise and descend in *Trees*. Now as their Life consists in Motion, and as 'tis the Fixation or Stagnation of the Humours which causes their Distempers and Death, I shall treat in the following Chapter of the Diseases and Death of *Trees*.



C H A P. V.

*Of the Accidents and Distempers; as also of the
Death of TREES.*

§ 1. **H**AVING largely treated of the Nutrition, Encrease, and Multiplication of a growing Substance, and partly shewn that this Work of Growth depends chiefly on an internal Action, which consists in a continual Motion, and a regular Harmony of all its Parts, daily Experience may now teach us, that every living Thing, after its time of Growth and Perfection is compleated, begins to fade and languish by little and little, till it falls at length into a total Extinction; after which it returns into its first Principles from which it proceeded. This Change is called *Death* and *Corruption*. Though all Things are subject to this Change and Corruption, yet we see nevertheless that one living Substance maintains and preserves its Perfection longer than another; and 'tis strange, that a Thing without Life should endure longer than that which has a living Spirit in it. If we confine our Observation only to a *Tree*, it is undeniable, that a Beam of the Wood of a felled *Tree*, placed as it ought in a Wall, shall last some hundreds of Years before it rots; whereas a living *Tree* can hardly hold out one hundred. It is not then an impertinent Question to ask, why a *Tree* may not live for ever, since it appears possible? For in the first place, 'tis always in the same Station; besides, it draws regularly every Year, according to Custom, a nourishing *Juice*. Moreover, it is accustomed for many Years to the Vicissitudes of Seasons, *viz.* Summer, Autumn, Winter and Spring, and so becomes no more subject to any Inconveniency from the Changes of Time or Air.

Let it be cold or hot, dry or wet, the *Tree* has been used to all, and can therefore bear it. Besides, it is not easily hurt by any Violence. In such a Disposition one would think it might last as long as the Sun; but Experience shews us the contrary. We may assign a great many Causes for this Inconstancy, and these Changes; but probably the Principal is, that *Trees* are like Men, compos'd of divers Principles; which, though they subsist together for a time in a perfect Harmony, Temperament and Mixture, yet they soon endeavour to prevail over each other, and their Discord is fatal to the Vegetable; for there results from it an Inequality of Motion, by reason of so many heterogenous *Particles*, which at length puts the whole Proportion and Harmony out of order: And if it happens that Things return for some time to the Order in which they were before, yet of necessity at last they must again fall into Disorder, especially in the vital *Juices*, which Disorder is followed by a Stagnation or Stoppage; this produces Corruption, and from thence, at length, a total Extinction and Alteration of the whole Being. Nevertheless, from this Corruption there is something produced different from what was before. Thus it is ever true, that the Corruption of one thing is the Generation of another; and in this manner a Thing changes into another Substance. Nevertheless, it is not therefore wholly annihilated; for he that is able to reduce any thing to nothing, can also create any thing of nothing; but both one and the other belong to the Omnipotence of God, and are forbidden to Men; nay, it does not become us to search into such Things. Now many People may imagine we reduce a Thing to nothing, when we cut a *Tree* to Bits, and put them into a Retort; for when we light a slow Fire under it, and it begins to distil, there comes out a Water, a Spirit, an Oil, a fix'd and a volatile Salt, and in short nothing remains but the earthy Part; and when we treat these several Parts in the same manner, we get something else, till at length all is lost under
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our Hands; it may then be said that the *Tree* is changed, and reduced to nothing: But we must elevate our Thoughts from Things visible to Invisibilty, and then we shall find that the Substance of the *Tree* is not annihilated, but requires another Artist to perform that Work.

As the eternal Wisdom has determined, that every Thing that has a living Spirit in it shall be subject to Corruption and Destruction, there could be no more proper or agreeable Means to execute it than Disease; for from thence proceeds all Change, even Death and a total Corruption. After this Supposition it may be asked, whether Diseases are Substantial, or Essences subsisting of themselves? But Diseases are no more Substantial than Health; though to be sick and well are two different and contrary Things. For Life and Health consist in a regular and natural State, and a just Disposition, while the whole Body is in a perfect Harmony, and all is executed according to the Laws of God and Nature, so as that every thing is in a perfect Motion, in which the Perfection of a Being principally consists. On the contrary also, when any natural Thing is changed, altered, or disorder'd so that the fluid or solid Parts suffer, and are hindred in their Functions, this accidental Being is called a Disease. If this gets the better, and the Motion be entirely stopt, there follows a total Annihilation and Extinction of the whole Being. Now as living Creatures are the most subject to this Change, we cannot but allow, that *Trees*, which have likewise a kind of Life, must also of necessity be subject to Diseases; and indeed it is what we may observe in their external as well as internal Parts: when these get the upper hand the *Tree* dies; and such Accidents may happen to a *Tree* while it is yet in the *Seed*.

Distempers of TREES while in the SEED.

Keep, for Example, any Grain of *Seed* in too cold a Place, then the *Seed-bud* will be condensed by the Cold and frozen; or

too much Heat, on the contrary, will scorch it, if it be not in the Bosom of its Mother Earth; or it may mould, or the *Root* may grow horny below, or canker'd, or the *Filaments* may be torn: In a word, there may happen to it some such Accident; and in this case we may say it was sick and dead from its Birth. If it be then put in the Earth it grows not, but rots immediately; the Soul being already, by such a Wound in the Head, separated from the Body.

Distempers of TREES out of the SEED.

On the contrary, if one keeps the *Seed* well, and plants it as it ought, it grows well, it is fresh and healthy, and arrives to its perfect Growth; but with its Growth its Infirmities and Diseases begin. In the mean time there are some *Trees* more happy than others; for one *Tree* shall be attack'd but by one Distemper at a time, while others are troubled with a great many. Sometimes there happen Accidents which affect but one part of the *Tree*; at other times the whole is infected. Sometimes a malignant Distemper begins with the outward parts of a *Tree*, but it soon seizes on the interior. And though it has the Advantage of Youth, yet the Number of its Distempers oppress it: If it grows old, it is still subject to different Maladies; sometimes the *aqueous*, sometimes the *saline*, and sometimes the *bituminous* Parts are predominant. Sometimes the Disease seems to be somewhat essential; but often it appears to be what it really is, only an accidental Evil; sometimes a vicious *Juice* is hereditary to the *Tree*, proceeding from some secret Imperfection in its *Seed*, and sometimes outward Violence does it a Mischief. The several Seasons occasion unhappy Accidents to *Trees*; as the Summer by too great Drowth and excessive Heat; and the Autumn by too great a degree of Moisture; the Winter by extraordinary Cold, and the Spring by piercing Mists, Rarities of the Air, and hurtful Dews, &c. *Trees* have also their epidemical Distempers. In short,

short, 'tis impossible to number all their Diseases and Accidents, with their Symptoms. We shall therefore only recount some few of them.

First Distemper: The MILDew.

Among these is the *Mildew*, which the *Latins* call *Rubigo*, which often reigns amongst *Trees*, and is like an epidemical Disease; it does them most hurt in the Spring, at which time the Earth begins to open, and the inclos'd Vapours to exhale. This is only a corrosive and nipping Dew proceeding from the Vapours which the Earth exhales, which being drawn up, and falling down again on the tender opening *Buds*, infects them by its Acrimony, and hinders the Circulation of the nutritive *Sap* in the proper Vessels; whereupon the *Leaves* begin to fade and wither, and the *Blossoms* and *Fruit* receive a very great Prejudice.

Second Distemper, caused by a kind of Fog.

A like Inconveniency may be occasion'd by a thick Vapour, or too abundant Dew. The Difference consisting only in this, that here there is not so great an Acrimony, but the Distemper is caus'd by too much Moisture, by which, if it remains long, the *Fibres* of the *Leaves* are too much dilated and enlarged; and if then the Sun shines hot upon them, it binds them so, that the nutritive *Juice* cannot act as it ought, and the *Leaves* begin to decay, to the very great Damage of the *Tree*.

Third Distemper: The UREDO.

Thirdly, *Trees* are subject to a Distemper, call'd in *Latin* *Uredo*, or Scorching, of which there are two sorts. The first happens when a subtile Dew or small Rain falls and remains upon the *Leaves*, being occasion'd by the piercing Beams of the Sun; for the Sun's Heat suddenly closes the *Pores* and *Fibres*, which
had

had been before dilated by the Moisture, and burns up the *Leaves*, which becoming brown and dry, at length fall off.

Secondly, We sometimes find a like Fervour in the internal Parts of the *Tree*, viz. in the *Pith*; but this does not proceed from an outward Cause, as that of the *Leaves*. There are some People who believe this is occasion'd by the transplanting of *Trees*, when we do not give them their right Position; but the East-side is turn'd Westward, and consequently the North side is expos'd to the South; for they imagine that the North-side of the *Tree* not being accustomed to the South Sun, is the Occasion of this Heat: But this is what I cannot comprehend: For as to this pretended Observation of Sides and Places, I think it a mere Folly: If the *Tree* is sound, there is a general and uniform Circulation and Nutrition; one side is nourish'd as well as another, so that every part acquires an equal Strength and Bigness. Now if the Sun occasion'd such an Ardour, I wonder it should not rather affect the *Bark* than the *Pith*. But I have often carefully examined the *Barks* of *Trees*, and could never find any difference between the North-side and the West; the East-side being always the same as the South: And I should take a great deal of Pleasure to see them wandering in the Woods, who pretend to be sure of distinguishing South from North by the *Barks* of *Trees* in a Forest. I, for my part, would rather trust to a good Guide, than to such Uncertainties. The true Reason why in transplanting a *Tree* this Ardour seizes the *Pith*, may be, because *Gardeners* commonly when they transplant cut the *Root*, little knowing the Damage they do the *Tree* in its Growth; for they cut away the lesser *Filaments* and *Roots* which suck up the *Juices* of the Earth. They cut the great *Roots* too, without covering the Wound with Wax or any such thing; and they pretend, that by this cutting, the *Tree* draws its *Sap* the better; which nevertheless is absolutely false, as we shall demonstrate in another place. Now as the Passage into the *Root* and *Pith* is thereby left

left open and free, there enters too much Humidity, which, corrupting the *Pith*, communicates a kind of Fervour to the *Root*, and thereby at length to the whole *Tree*. This happens too, when the *Tree* growing old, its *Roots* begin to rot; whereby this Heat not only consumes the *Pith*, but passes also to the very *Bark*. The Books of knowing *Gardeners* shew how these Inconveniencies may be cured and prevented.

Fourth Distemper: The SINGEING or BLASTING of the BUDS.

Fourthly, *Trees* are troubled with the *Blasting* of the *Buds*; for if a Frost happens when the *Leaves* and *Blossoms* are wet, the Moisture condenses, and they seem to be iced or candied over: Hereby the *Pores* are closely shut, and the vital *Juices* are suffocated; and then the Sun breaking suddenly upon them they turn yellow, and round fiery Specks come upon them; from whence often proceed those Tumours, like *Warts*, which when they begin to rot, are found full of *Maggots*.

Fifth Distemper: The WORM.

In the *fifth* place, *Trees* are subject to a Distemper, which is called the *Worm*: Hereby we do not mean *Caterpillars*, *Snails*, *Earth-Worms*, *Ants*, *Ear-wigs*, or any the like *Insects*, which indeed are very hurtful to *Trees*; but by *Worms* we understand those little *Animals*, which are the Product of the putrified Substance of the *Leaves*, the *Bark*, the *Pith*, the *Roots*, the *Fruit* and *Blossoms* of the *Tree* it self, and which are very prejudicial to it.

Sixth Distemper: The FALLING of the LEAVES.

Sixthly, *Trees* are liable to the Infirmary of losing their *Leaves* before the due time: This is called the *Falling* of the *Leaves*, and happens when they sprout too soon, and are suddenly surpriz'd by either too great Cold, or an excessive Heat, or when
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the *Sap* falls all at once, whereby they receive no more of the nutritive *Juice*: Not to speak here of a great many other Causes which may occasion their being shed before the ordinary time.

Seventh Distemper: The CONSUMPTION.

Seventhly, *Trees* are sometimes attack'd by a *Consumption*, which commonly proceeds from a want of Sustenance, through failure of the nourishing *Juices*; which when they no longer rise in the same abundance, the Parts are constrain'd to close one within another, and dry up. This may also happen from the Obstruction of the *Veins* and *Roots*, or the ill Digestion and Secretion of the Humours, &c. This Distemper is of the worst Consequence to *Trees*, and a sure Fore-runner of their Death.

Eighth Distemper: STERILITY, or BARRENNESS.

Eighthly, We have often reason to complain of the *Barrenness* of *Trees*, and may very well place it among their Diseases; for we often see, with Concern, a *Tree* that outwardly seems fresh, healthy, and in good plight, bear no *Blossoms*, or if it does, they fall and produce nothing; or else, after they are set, the *Fruit* falls without ripening. Many have taken not a little Pains in enquiring into the Reason of this *Sterility*; some attribute the Fault to the ill ingrafting of the *Cions*, or else to their being prun'd too early, in order to expedite their Growth, which is the Cause of their producing only *Flowers* and no *Fruit*. This is the Reason Mr. *Elsholts* gives in his Book of *Gardening*, and is not to be despised; but I rather think that this *Barrenness* ought principally to be attributed to the Soil, which is often too sandy. A *Tree* may also have good Earth above, and nothing but Gravel at Bottom; from which the *Roots* receive not enough of the nourishing *Juice*; and for want of which they do not blossom; or if they do, they produce no *Fruit*; or bringing forth *Fruit*, it falls before the time. The *Sterility* of a *Tree* may

may also proceed from its Situation, as from its being where it is too much shaded, or not enough under the Influence of the Sun, or perhaps in a place too wet and marshy; when the Cause of the Defect is found out, it will be easy to remedy it.

Ninth Distemper: The JAUNDICE.

Ninthly, *Trees* are also troubled with the *Jaundice*, which is a Distemper that does not hinder them from appearing sound in Body; but when they begin to sprout, the *Leaves* are of a whitish Green, and as they grow bigger they turn yellow, whereby they become Objects of our Compassion, as much as human Creatures who are troubled with the *Jaundice*, and whose Colour offends our Sight, however amiable they were before. This Distemper may proceed from external Causes; as the *Mildew*, of which we have already spoken; but it comes principally from an internal Defect, the Original of which we must trace to the *Root*, which is either in a stony or chalky Soil impregnated with an acid Salt. The ill Concoction or Digestion of the vital *Juices* may also contribute much to the Disease. When we perceive this, it is time to make use of a Remedy, otherwise the *Tree* will wither and die.

Tenth Distemper: The SCURF.

Tenthly, We find on *Trees* a kind of *Scurf*, &c. to which Distemper the *Bark* of the *Tree* is most subject. The cause of it may be a too great Dilation of the *Pores*, whereby they attract too much Humidity by insensible Transpiration, which the Air coagulates and hardens; then the *Bark* cracks, and seems cover'd with a kind of *Leprosy*, which of it self does great Damage to the *Trees*, because in Summer *Trees* have not a sufficiently free Transpiration thro' so thick a Substance. 'Tis likewise by Accident the Cause of other Mischief; for the *Vermin* finding a Retreat in these rough unequal Cavities, make them
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their Winter-Quarters, and live upon the *Bark* as well as the *Tree* it self, which is a great Prejudice to it: But for this there is a known Remedy.

Eleventh Distemper: The Moss.

Eleventhly, *Moss* is very prejudicial to *Trees*; for we rarely see *Moss* on a young *Tree* that is fresh and sound; such a *Tree* is already infected with a corrupt nutritive *Juice*, and will soon begin to decay; for, as we have said before, the *Moss* has its *Roots*, and must necessarily draw its Nourishment from a tainted *Juice*. Now this being known, we ought to take great Care, lest the *Tree* receive Damage by it, and die.

Twelfth Distemper, occasion'd by Excess of COLD or HEAT.

Twelfthly, We have continual Experience of the Effects produced by the excessive Heat of the Sun, and by a too intense and penetrating *Cold*; for all degrees of *Cold* are not prejudicial to *Trees*: 'Tis only when it is too sharp that it does hurt, as the Curious in *Gardening* find too often; and the Evils, which are the Effects of Storms, excessive Rains, Hail, &c. are sufficiently known. But as these are the Dispensations of Heaven, we ought not to murmur, but bear them with Submission and Patience.

Thirteenth Distemper: WOUNDS.

Lastly, We ought to say something here of the *Wounds* of *Trees*, which, when they are great and deep, are incurable and mortal, especially when they penetrate to the *Pith*; and are made with some large Instrument, as an Ax, a Sword, &c. But every *Wound* in a *Tree* is not mortal, as we daily experience in Inoculating, Grafting, and the like. Nay, we may cut whole *Branches* in pieces, and the *Root* it self, without hurting them, provided we afterwards dress them, as we ought, with good
Plasters

Plaisters and Unguents. But what is very surprising, is, that by a certain manner of cutting them to pieces, the *Branches* shall become *Roots*, and the *Roots Branches* of *Trees*, as we shall shew at large hereafter. As to *Fractures*, *Wounds*, *Tumours*, and *Excrescencies* in *Trees*, they may be cured by *Plaisters*, *Ointments*, *Bandages*, &c. of which abundance of Books treat.

To conclude, it may yet be ask'd, why the more a wild *Stock* is wounded, cut, and grafted on, the more delicious the *Fruits* should be which it produces. It is perhaps, in the first place, because the *Graff*, which had been set on it, was of a better Nature than the wild *Stock*; and perhaps the second *Graff* was still of a better kind than that. Now the *Sap*, though it cannot immediately penetrate into the *Graff*, yet it collects it self into a new Matter, by means of the strange *Juice*, and forms a Substance like a *Callus*, which is properly the Place where the subtile *Juice* separates it self; and as it there becomes very thin and spiritous, it follows necessarily that the *Sap* being so purified, the *Fruit* becomes much more delicate.

§ 4. As we have treated largely above of the Accidents and Distempers of *Trees*, it may be thought proper that we should insert here a Method of curing them regularly, and according to Art; and that we should say something of the manner of treating them, according to their different Natures, since some require a deep Soil, and low Situation; and others a more elevated Station; some a fat Soil, and others a poor one; some delight in the Shade, and others in an airy Place. It may be also requir'd of us to give an Account of the Manner how a *Tree* ought to be treated, which being, as we may say, born in, and accustomed to one kind of Ground, is transplanted to another, where it will not grow. As also how to preserve *Plants* from violent Heats and Cold, from great Drought or Wet. Likewise in what manner one should transplant different *Plants*, and remove them from one Country to another, and the like: But

since there are every where *Gardeners* who know these first Elements of their Profession, and many Authors have written upon such common Subjects, I think it fit for me to be silent, and to refer the Curious to them.

Now since there are so many Distempers, which still multiply every Day, it would be almost necessary to establish Academies for the Benefit of *Gardeners*, where they might be instructed in the Science of *Gardening*, and get a thorough Knowledge of the Fundamentals of their Profession. For a great many Gentlemen, Lovers of *Gardening*, have often the Misfortune to meet with such *Gardeners*, who being wholly ignorant of the Foundations of the Art, and having only a confus'd Knowledge of the manner of Dressing and Improving a *Garden*, serve only to ruin and destroy all. For he that would pass for an understanding *Gardener*, ought to be well grounded in the Philosophical Principles of his Art; and if he would order a *Garden* after the *French*, *Italian*, or *Dutch* manner, he must travel to those Countries, because it is impossible any Description should contain all that is remarkable in such fine and noble *Gardens*. When I reflect on *Versailles* only, and what I have seen there, I cannot but think I had a Foretast of Paradise; all my Senses were struck with Astonishment. And tho' I have the whole represented in fine Prints, 'tis only a Shadow of what was so naturally figur'd there. Therefore I think it absolutely necessary, that *Gardeners* should travel into foreign Countries.

An intelligent *Gardener* ought to understand Water-Works; to have some Knowledge of Sculpture; to be perfect in Fencing, in Closing, and Ordering the Compartments of *Parterres*; in *Grotto's*, *Green Arbours*, and *Cabinets*, after the *Italian*, *French*, or *Dutch* manner; he ought also to know how to make Galleries, and to assign the proper Places for *Pyramids*, *Obelisks*, and *Statues*; and how to order cover'd *Alleys*, *Bowers*, and *Trellis Works*. He ought also to know something of Architecture

recture and Painting, that he may be able to design and draw Plans, and to make all sorts of Models of *Gardens*, *Green-Houses*, and *Glass-Cases*. He should also be a good Naturalist, that he may reason pertinently of the Difference and Goodness of Soils. He ought to study the Nature and Temperament of *Plants*, that he may know which of them requires a hot, dry, or a fat Soil. Moreover, he ought to observe the Difference of *Seed*, whether it be good or bad; to know how to sow it; to gather it in time; and to preserve it: And in this he must observe the Seasons, the Months, &c. Besides, he ought to know thoroughly how to order a *Flower-Garden*, a *Kitchen-Garden*, a *Physick-Garden*, and *Orchards* for *Fruit-Trees*; and what he ought to plant in one and the other, that so he may not place that in the *Kitchen-Garden* which should be in the *Flower-Garden*; nor plant any thing in the latter, which ought to be in the *Orchard*. Above all, he ought to have a perfect Knowledge of *Orange* and *Lemon-Trees*, how to preserve them, and when to carry them into the *Conservatories*, or *Green-houses*; how to manage them, so that they may not receive too much Heat, nor too much Cold, which are equally prejudicial to them; and, in short, to be perfectly versed in all that concerns *Gardening*. To the Knowledge of the Culture of *Trees*, must be added that of all kinds of *Grafting* and *Inoculations*, *Planting*, &c. and such other Sciences as tend to the Improving and Encreasing of *Plants*. When he can acquit himself handsomely in all these Operations, he must consider in what manner the new *Trees* ought to be treated; when, and how he may transplant them, and how manure them, water them, and preserve them from *Vermin*. Every *Gardener* ought also to know how to use *Trees* that are too much loaden with *Fruit*; how to preserve them from any Violence that may be hurtful; and to support and ease them under their Burthen; and, in due time, to gather the *Fruit* without damaging the *Tree*; and not,

as the too frequent Custom is, to shake the *Tree*: They who do so, little consider that thereby the *Tree* is hurt, and the Fruit is bruise'd, and decays.

An intelligent *Gardener* ought, in respect to his *Plants*, to act the Part of a Physician, to consider judiciously their Diseases, as well internal as external, and to treat them according to Art.

In fine, since I have sufficiently prov'd that *Trees* have both Body and Soul; and since 'tis undeniable, that whatever has Life must die, it follows, that they cannot last for ever, but must perish upon the Separation of the Soul from the Body. This Separation is made by means of the Diseases, of which we have spoken, and which are followed by Death, call'd by a certain Heathen *Horribilium Horribilissimum*. And since the Soul, in this Separation, (whether it goes upward or downward) leaves the Body without Life, and lying where it fell, it is my Duty to render it the last Honours, and to prescribe a handsome manner of interring this ligneous Body. And herein I shall follow the Method of Interment, made use of by the antient *Greeks*, *Romans*, *Gauls* and *Germans*; and which is still in Fashion among the Inhabitants of *Japan*, *Peru* and *Mexico*, the *Tartars*, *Siamese*, and Subjects of the great *Mogul*, as appears by several good Authors, viz. *Petr. Bertius*, *Christoph. a Costa*, *Casp. Barlaeus*, and others. For their Custom was to burn their dead Kings and great Men on a Pile of aromack and precious Wood, thereby giving them a mark of their Acknowledgment and Respect, and gloriously terminating their Pomp and Royal Magnificence. Let us then give the same Funeral to fallen and dead *Trees*. Let's assemble them in order, heap them one upon another, and burn them, that we may have the Benefit of their Heat. And as the *Siamese*, after burning and reducing their Dead to Ashes, pass them through a Sieve, and blow them into the Air; so let us to the Honour of *Trees*, after we have entirely

ly consum'd them, throw their Ashes, not into the Air, but upon the barren Fields, that by the Remainder of the *Saline Particles* which they still retain, they may communicate to the Earth what they have of good in them. But if our Maids have a mind to sift them, in order to make a good *Lye*, and reserve it for their Use, I approve of it, since that will tend no less to the Honour of *Trees*. Now as our Death is followed by a Resurrection, I proceed to consider whether we may hope the same thing of *Trees*, which shall be the Subject of the next Chapter, the last of this Section.

CHAP. VI.

Of the Resurrection of the dead TREE, as well within as out of the SEED; and of the Eternal Life of all TREES.

§ 1. **A**FTER the *Tree* has been reduc'd to Ashes, with all its Parts, there remains yet this curious Question, *Whether it be possible to revive it from its Ashes; and whether the Vegetative Soul may hope to go to the Trees in Paradise?* This Question may be look'd upon as something heterodox, and may draw on me the Resentment of Divines, which will give me no great Concern; for I shall confess freely what brought this Thought into my Head. 'Twas a Divine himself, viz. the Reverend *John Christian Netringer*, Parson of *Morl*, who has publish'd a Treatise of the artificial Resurrection of *Plants*, Men, and other Animals, from their Ashes, and who has given me the Occasion of entering into this Enquiry. Whether that Di-

vine

vine has attain'd the Art or not, is what I cannot tell; but we have room to believe that this Matter gave him no little Delight, since he employ'd so much time in it, and took so much Pains to communicate it to the learned World as something new and pleasant. If then a Divine has been allow'd to busy himself with these Thoughts, I think it may become me much better, as a Naturalist, to examine the Affair a little more nicely. Accordingly I shall produce my Thoughts according to my *Hypothesis*, (with a *Salvo*, nevertheless, to the Opinions of others) for these are not Things to make Articles of Faith of.

§ 2. In the first place, this principal Question must be proposed, Whether there be such an Art or Science as teaches to raise *Trees, Shrubs and Flowers* from their Ashes, so as that they may be seen for a certain time, and then disappear: Such as will not believe it, must expect a multitude of grave Authors on their Backs, who affirm the Fact. And 'tis amazing to see what a Crowd of Writers tell it us in the *Palingenesia Francica*, p. 25, 26, 27, who seem to be truly in earnest, and perswaded of the Thing they write for. But as I have been glad to find some who have rejected and laugh'd at this Art, I shall place my self on their side, not doubting but there will be more Opponents than Acceptants: Yet I ought to use a little more Circumspection, and not to write so freely, considering how many credible Witnesses and fine Experiments they have to support them. Let us only reflect on this strange Relation, which *Quercetanus* gives us among others, with so many Particulars, in *Hermet. discipl. defens. contra Anonymum*, Tract. 1. Cap. 23. Pag. 26. These are his Words:

HISTORY.

' It is about twenty six Years since, that a certain Physician at
' *Cracow* in *Poland*, found out the Art of preparing the Ashes
' of all the Parts of a *Plant*, in such a manner, that he could
' revive

‘ revive the *Plants*. He prepar’d so naturally, and with so much
 ‘ Skill, the Ashes of all the Parts of any *Plant*, with all its Co-
 ‘ lours and Lineaments, and retain’d their Spirit so artificially,
 ‘ as being the Cause of all their Virtues, that he had more than
 ‘ thirty of these *Plants*, prepar’d thus from their Ashes, in little
 ‘ Glasses, sealed hermetically, with the Name of each *Plant*,
 ‘ and its Properties superscribed; so that when he was desir’d to
 ‘ shew a *Flower*, for Example, a *Rose*, a *Marigold*, or *Poppy*,
 ‘ red, white, or mottled, he had recourse only to the Ashes of
 ‘ the requir’d *Plant*; if a *Rose* was demanded, he took the Glas
 ‘ on which the Name *Rose* was written, and setting it over a
 ‘ burning Lamp, the subtile and imperceptible Ashes, as soon
 ‘ as they became a little warm, began to rise, and plainly to as-
 ‘ sume the Form of an open *Rose*. One might perceive even
 ‘ its Growth, and how by little and little it represented the Form,
 ‘ Shadow, and Structure of the *Foot-stalk* and *Petters* of a bloom-
 ‘ ing *Rose*, till at length it produc’d a *Rose* perfect and full
 ‘ blown; and nothing could be more agreeable, than to see a
 ‘ blown *Rose* perfect and regular in all its Parts appearing like a
 ‘ Shadow, so that one would have sworn ’twas a real *Rose*, tho’
 ‘ one saw only an empty Form endow’d indeed with a spiritual Ef-
 ‘ fence, which wanted nothing but to be planted in a suitable
 ‘ Ground to acquire a durable Body: But this Form fell again
 ‘ to Ashes; and upon taking the Glas from the Fire, disap-
 ‘ pear’d by degrees, and return’d to its *Chaos*.

To make an *Analysis* of this Story, ’tis necessary we should understand that the *Palingenesia*, or the Resurrection of *Plants*, is a wonderful Art, to raise from its Ashes a *Tree*, *Flower*, or the like thing, so as that from these Ashes, enclosed in a Bottle sealed hermetically, there shall grow, and be visibly a *Tree*, with all its *Colours*, *Branches* and *Twigs*; but that, as the Heat diminishes, the *Tree* shall disappear, and return, by little and little, to its *Chaos*. A wonderful Art indeed! But who has ever

had this Art? *Quercetanus* tells of one at *Cracow* in *Poland*; What was he? A Physician. Is that enough? How did he go about it? The Text tells us, that he prepar'd, in a Philosophical manner, the Ashes of any *Plant*, so as to make them represent it with all its Colours, Lineaments, &c.

This Physician then must have been a great Philosopher as well as Alchymist; for he did not burn the Ingredients the common way, as our Servants burn Wood in Chimnies; if he had acted in the ordinary manner, as we use to calcine, or burn *Herbs* (in as much as the Calcination of any Matter is an Operation, by which the Fire soon converts the Body to Ashes) he would not have needed to use so many Ceremonies: But this common Operation would not do, the Business must be treated Philosophically. How is it possible, and who has ever heard, that after a thing is calcin'd it should keep its Colours and Lineaments as before? But there must be some great Mystery hid under this, which perhaps I shall find out. He dissolv'd it by a Philosophical Calcination, with the help of some corrosive *Liquor* or *Menstrum*; for this Operation dissolves Bodies without Fire, and divides the whole Substance into its smallest *Particles*. The Colour of the *Rose* was extracted by this *Liquor*; oh wonderful! but how all the Parts should retain their Form and Lineaments after so minute a Separation, is something too sublime for my Understanding, and what I cannot comprehend. Nevertheless, my Sentiment thereon is, that when the Dissolution was perform'd, the *Liquor* was pour'd off, and the *Chaotick* matter settling at the bottom like Ashes, this subtile *Rose* was produc'd from it.

Having labour'd and sweated to bring this Matter to Perfection by his Philosophy, that Learned Alchymist knowing that nothing can subsist without Spirit, he therefore by his incomprehensible Art could so ingeniously intercept and retain the Spirits, that at his Command they collected the separated and dissolv'd Matter, and coagulated and animated it anew. The
Words

Words of the Text are, that he very artificially retain'd the Spirits, as being the Cause of all these Virtues. What a Misfortune 'tis this wise Man did not communicate to the World his Art and Manner of catching and enclosing in little Glasses seal'd hermetically, the wandring Spirits and Souls of *Trees* and *Flowers*, and keeping them like familiar Spirits! How much Diversion have I and other inquisitive People lost for want of this Science!

I shall examine carefully and particularly his Method of Operation. The History tells us, that when any one desir'd him to revive a *Rose* or a *Marigold*, he took those imperceptible Ashes of the *Plant*, and putting them, with all imaginable Circumspection, in a little Bottle, hermetically seal'd up, set them over the Flame of a Lamp. The Words are these; 'If a *Rose* was requir'd, he took the Glass on which *Rose* was written, and setting it over a Lamp, the imperceptible Ashes, as soon as they became warm, began to rise and appear in the Form of an open *Rose*, which one might readily distinguish, and even perceive its Growth, by little and little, &c.' This is a Subject to reason upon, especially these *imperceptible* Ashes; for what is corporeal (as Ashes are) may in some measure be perceiv'd, as every Body knows; but we must take this Phrase, as if spoken of the Philosophical *Cornu Cervi* of an Apothecary, which must be pulverised so very fine, that we cannot feel it between our Fingers. Then he made use of common Fire under this pulverised Matter, But where was the Philosophical Fire? There is not a Word said of that; but since he knew of nothing better, the ordinary Fire of a Lamp served. Well, what was the extraordinary Product of this Operation? What indeed must be heard with Astonishment; for as soon as the Matter grew warm, the Form of a *Rose* appear'd, and one might plainly perceive its Growth. Listen, O ye *Empyricks* in *Botany*, and ye clear-sighted People, attentively; I am perswaded no corporal Eyes,

not even those of a *Lynx*, could see a thing grow; but if what the History affirms be true, we may hope in time to hear the sweet singing of Mites in a Cheese, and see the Sun dancing a Horn-pipe at Midnight. What properly was this Growth? Not a corporal but a spiritual one; for the Matter which was of the Substance of the *Rose*, did not become a real *Rose*, since it only produc'd a spiritual Essence and Shadow. This is directly contrary to the Order and Constitution of a true Resurrection; whereas when we would counterfeit a thing, we ought to observe some Regularity; and therefore the Spirit should not appear alone, but together with the Body, which it must inform, animate, and actuate anew. But in this Resurrection the Body remains, as it were, bury'd, and the Vegetable Soul appears by it self. These are the Author's Words; 'This Form appear'd
' like a Shadow, and one would have sworn it to be a real *Rose*,
' tho' it was only an empty Form endow'd indeed with a spiritual
' Essence; and which, upon taking it from the Fire, fell again
' to Ashes, and disappearing by degrees, return'd to its
' *Chaos*, &c

I think I understand what this sage Philosopher means by his spiritual Essence; for he pretends that the Form of Vegetables, as *Trees*, *Shrubs* and *Flowers*, is an immaterial Being; and perhaps he has read in *Sperling Inst. Phys. Prac.* 4. that we must distinguish between the material Cause of a Being, and the Cause or Reason of the Essence it self; but that has been long ago refuted; though it can't be deny'd (according to the Ideas I have) but we may very well establish an intrinsic Principle, or Form, or what you'll please to call it, in things especially which are nourish'd and multiplied; and upon Enquiry into the matter, we shall find that Forms are of two kinds; the one is immaterial, and a Being of immortal and eternal Duration, which has nothing corporeal in it, being like the Nature of Angels, and like the Soul of Man. There is also another Form which is material, and has something
corporeal

corporeal in it, as to its Effence, tho' it is not a common Matter, but an elementary, subtile light, and moveable Substance, which receiv'd in its Creation a Law, according to which it is to move and exercise in an organiz'd Body the Powers and Qualities impress'd on it; but when that Body is dissolved, and no longer in its regular State, this Spirit can act in it no more, much less can it present it self to View, as a Form without a Body. Therefore I should be very curious to know how this *Adept* could force his *Spirit of a Rose* with the common Fire of Lamps, to appear unembodied, and only as a spiritual Effence, or Ghost, tho' with all the proper Colours, in the manner they appear'd in his *spiritual Form*; and after having been seen for a time, to return to its primitive *Chaos*, like a Bear to his Den, according to the *German* Proverb. For my part, I'm perswaded that this Appearance was of the same Nature with those perform'd by Magick Lanthorns, by which one may represent on a Wall *Roses, Trees, Plants, &c.* in their liveliest Colours, which are nothing but Shadows, and by withdrawing the Object, disappear at once. And 'tis well known, that by the same Means one may represent a Figure sometimes smaller, and sometimes bigger, so that a *Rose* or a *Tree* may seem to grow in the Sight of the Beholders. And I cannot but believe that this Philosopher made use of some such Instrument to impose on his Spectators in Opticks. *Miraldus, Lemnius, and Porta*, have apparently contributed much to this. Now that this Art is repugnant to the Laws of Nature, is certain, since, according to these Laws, an extended, colour'd, and illuminated Body, which has all its material Parts regularly dispos'd, and receives its Colours by Illumination, cannot be made invisible, or disappear from our Eyes. What Superstition and Imposture, Enchantment, *Legerdemain*, and diabolical Arts may do, is another Question.

I would not here attack or prejudice the Honour and Reputation of that Physician, or have my Reader judge the worse of him,

him, on account of his Skill in the Resurrection of *Plants*, in as much as his manner of operating is a Mystery, and unknown to me. Let those who understand, and favour his *Hypothesis*, explain it. In the mean time I shall communicate to the Curious two Relations out of the *Hall of Theosophical Wonders*, &c. pag. 53. which are as follow.

First EXPERIMENT.

‘ Take, in fine Weather, of the ripened *Seed* of *Herbs* or
 ‘ *Flowers*, two or three Pound, or as much as you please, and
 ‘ beat it very small in a Glass or Iron Mortar, then put it in a
 ‘ well closed Retort, that nothing may evaporate. After which,
 ‘ in a fine Evening after Sun-set, the Sky being clear and serene,
 ‘ open the Glass, take out the *Seed*, and put it on a clean glaz’d
 ‘ Tile, and that in a proper Vessel, which you must place in a
 ‘ *Garden* in the Evening, so as it may receive the Dew, but be
 ‘ out of the way of any *Vermin*; at break of Day, when the Rays
 ‘ of the Sun begin to reflect on the Earth, put the *impregnated*
 ‘ *Seed* again into the Retort, which you must close very well to
 ‘ hinder any Evaporation. You must also receive, in a clean
 ‘ fine Linnen Cloth, to the quantity of ten or twelve Quarts of
 ‘ Dew, which you must distil in a Retort in Sand, *secundum ar-*
 ‘ *tem*, and repeat the Distillation till the Dew leaves no more Se-
 ‘ diment; and take an especial Care both in the Distillation, and
 ‘ afterwards, that the Dew does not evaporate; put up the col-
 ‘ lected Sediments, after having calcin’d and wash’d them well
 ‘ with the distill’d Dew, or Rain-water, that the Salts which are
 ‘ in them may be got out; you may *crystallize* them by Evapo-
 ‘ ration, or take them out dry; but in doing the latter, you
 ‘ must be very observant of the proper time, therefore I would
 ‘ rather advise you to *Crystallisation*: Let the Salt which was
 ‘ wash’d out be reunited with the distill’d Dew, and a Solu-
 ‘ tion be made; then put of this on the *Seed* which you kept in
 ‘ the

‘ the Retort, so much as may cover it to the height of an Inch,
 ‘ which seal hermetically; that is to say, stop it well up with
 ‘ pounded Glass and melted *Borax*, and then put it into a Stove,
 ‘ or into Horse-dung, there to digest this Mass for a Month, *se-*
 ‘ *cundum Artem*; which Term being expir’d, take out the Re-
 ‘ tort, and upon a Review you will find the Mass separated into
 ‘ three Parts, on the Top will be a fine loose Skin of different
 ‘ Colours, (which is the incorporated Principle of Life) at the
 ‘ Bottom, a glutinous Earth, like Gelly (which is the *Quarz*)
 ‘ and in the middle an accidental Dew, which is the Element.
 ‘ Place, or hang the Vessel gently, where it may be in the In-
 ‘ fluence of the Sun by Day, and of the Stars by Night: And in
 ‘ cloudy or rainy Weather be careful to remove the Retort to a
 ‘ dry Place, till the Heavens clear up, at which time you must
 ‘ replace it where it was before, that it may participate of the
 ‘ Light of the Sun, Moon and Stars. This must be continued
 ‘ till the Mass turns to a kind of Ashes of a palish blue Colour,
 ‘ which, as often as you gently warm the Glass, produce a *Stalk*,
 ‘ *Leaves* and *Flowers*, according to the Form of the *Seed*, which
 ‘ disappear as soon as the Vessel grows cold. This Production
 ‘ and Extinction lasts as long as the Glass remains seal’d. It is
 ‘ besides remarkable, that through the Influx and Reflection
 ‘ of the Sun’s Rays on the Glass, there results a subtle Vapour
 ‘ (which is the spiritous Phlegm, or Mist of the Element) which
 ‘ rises and falls, according as the Sun penetrates strongly or fee-
 ‘ bly through the Vessel.

Second EXPERIMENT.

‘ They who would extract the clarified Body of the *Plant*
 ‘ from the bluish Ashes of the Mass, need only open the Glass
 ‘ with an hot Iron, and then pour on the Mass some distill’d
 ‘ Dew or Rain-water, and act as before, as to the Digestion and
 ‘ Lye, till the Water which comes from it becomes insipid or
 ‘ taste-

' tasteless, as it was before it was put thereon: Evaporate the
 ' collected *Lye*, till there remains only a Scum, and let the Salt
 ' crySTALLize in a cool Place: Let this Evaporation continue till
 ' there rises no more Scum, or till it has done crySTALLifing. Take
 ' one Part of this crySTALLiz'd Salt, and two Parts of *Terrene* Salt,
 ' which has been well purified, coming from a fertile and fat Soil;
 ' mix and levigate them together for some Hours with a Mullur
 ' on a Glass or Marble-Table; then put them into a Glass Re-
 ' tort with a wide Neck, and place that in serene Weather, af-
 ' ter Sun-set, in a *Garden* or Field for a Night, that the Dew
 ' may fall on it. In the Morning close the Vessel by Fusion,
 ' and expose it for three Months to the open Air; then open the
 ' Glass, and wash the Mass again with distill'd Dew or Rain-
 ' water; then the Dew begins to exhale and crySTALLize as before;
 ' afterward gather the Crystals, and mix them with a like Weight
 ' of *Terrene* Salt, drawn from the Earth of a Meadow, or good
 ' Soil; put all together into a Glass Retort, which seal up, and
 ' put in *Balneo Mariæ*, where let it digest till the Mass be turned
 ' to Water, and there remains only a little Sediment at bottom:
 ' Afterwards put the Vessel into a dry Bath till the Water coagu-
 ' lates again, and appears altogether dry, and of a permanent
 ' Colour; and being cool'd, take out the Glass, and opening it
 ' with a hot Iron, you will find the Mass like a heap of fine Dust,
 ' which is blown away by the least Breath of Wind; therefore
 ' blow upon it, and clear from it what remains, being an an-
 ' gular and softish Crystal, in which (holding it against the
 ' Light) you may perceive the Figures of the *Plants* with their
 ' *Roots, Stalks, Leaves and Flowers*, with many strange and a-
 ' greeable Colours. And what is still more wonderful is, that
 ' this Crystal has and retains the Taste of its proper *Plant* in a
 ' much higher Degree than the *Plant* it self, which is worthy of
 ' Consideration. The Artist nevertheless ought to take this
 ' Rule along with him, that he prevent all he can the Evapo-
 ' ration

‘ ration during the whole Course of his Work. Almost every
 ‘ Body knows, that in Winter-time all manner of Figures are re-
 ‘ presented upon Glass-Windows, not only by means of the
 ‘ Breath of Men, but of the hot Vapours of an Oven in Places
 ‘ where *Vegetable* and *Animal* Bodies are consum’d; and like-
 ‘ wise that Glass is compos’d of a white and transparent Sand; as
 ‘ also of the Ashes and Salts of several Vegetables. But Silence,
 ‘ *Pamphilius!* and give good Attention.

It will be easy to think what Judgment to make of these two Experiments, according to my *Hypothesis*. I have never indeed put them to a Proof, having no mind to throw away my Time, Labour, and Money so unprofitably; but if I was desirous to attempt a Resurrection with the *Seed*, I would, for that purpose, take only the *Seed-buds* or *Germes*, of which I have spoken, for they have in ’em the whole Form of the *Tree*; and one might perhaps at length invent a *Philosophical Mercury*, to agitate the *Ætherial Matter*: But I leave that Employment to such curious Persons as delight in a Resurrection of Shadows, and only wish they would be so good as to raise my deceas’d *Trees* from the Dead, I should acknowledge the Obligation with abundance of Gratitude.

As to these Experiments, recited at large in the aforesaid Treatise, the Folly, Ignorance, and Chimerical Ideas of the Undertakers of such an artificial Resurrection, appear throughout the whole; for they perhaps imagined, that in their glaz’d Ashes; their Oil of *Nuts*; their Vinegar tinctur’d with Green; their Glister bladders; and even in Dung and Excrement it self, they could discover the finest *Flowers* and handsomest *Trees*. It is true, that by means of the nitrous and saline *Particles*, they saw something, which they might as well have call’d *Ships* or *Castles*, as reviv’d *Trees*. But to fortify them in their wise Notions, and the Ideas they have form’d, I will show ’em a better way of representing to themselves, either in Summer or Winter,

Things which, after an Appearance for a time, vanish from the Sight, and this, without giving themselves so much Trouble. In Summer let them contemplate with wonder the *Clouds*, and diligently find out and nominate the *Woods*, *Trees* and *Plants* that are therein. In Winter let them reflect on the many amazing Things which are represented on the *frozen Windows*; then, if they have a mind to think on the Resurrection, 'tis very piously and wisely done of them. Now, that I may pass among the Adept for an Artist, and make it appear that I, as well as the *Polish* Physician, am Master of the Secret of shewing Men *Animals* and *Trees* in Glasses, I will let any one that desires it see, in three several Glasses, three different *Experiments*, which I am perswaded will be as well look'd upon by Posterity, as those of that Physician. You may see in my Glasses first a *Tree*, then a brute *Animal*, and lastly a *Man*. They are properly nothing as to their Essence, yet are corporeal, tho' not to be touch'd or felt, by reason of the Delicacy of their Bodies. They appear black like a Shadow to our Eyes, but yet they are corporeal. They have actually no Colour but that which is born with them; but they are capable of receiving any other you please, however odd it may seem to us. When one has a mind to see them, it must not be in the Dark; but the more Light one has, the better he may examine the Form of their subtile Bodies: And what is most strange is, that their transparent Bodies deriv'd their Original from an intelligent Soul, which animated a sound Body: Nevertheless, in their Birth, they receiv'd nothing of Intelligent, but only a Being without Life or Motion. But tho' they cannot move, they travel, notwithstanding, all the World over; they pay no Money, but have it paid for them on many Occasions: They cost very dear; but an honest Man, with good Luck, may make a pretty Fortune by them. If one touches them in their Infancy, they feel moist and soft, and perhaps may soil one's Fingers; but growing older, they become firmer,
and

and of a stronger Constitution; their Life is of long Duration, and may extend to several Ages, provided they meet with no Violence, or are not attack'd by their Enemies the Mice. We might say a great deal more of this Work of Shadows, but that would be carrying the Jest too far. There remains yet this more curious than useful Question to be resolv'd, Whether the Vegetative Soul, as a Creature that acts and suffers in this World, may not hope for a Recompence in another, and a Place among the *Trees* of the Celestial Paradise? To this I answer, Such as their Life is, such is their Death; such as their Death, such is their Resurrection; such as their Resurrection, such is their Heaven and Life eternal.

Here I shall leave these merry Speculations, and pass to something better, from which the Lovers of Gardening may draw more Satisfaction and Profit.

Explanation of the Fourth Plate,

Which represents three several Vessels, wherein are three Objects artificially reviv'd, which appear to be something but are really nothing.

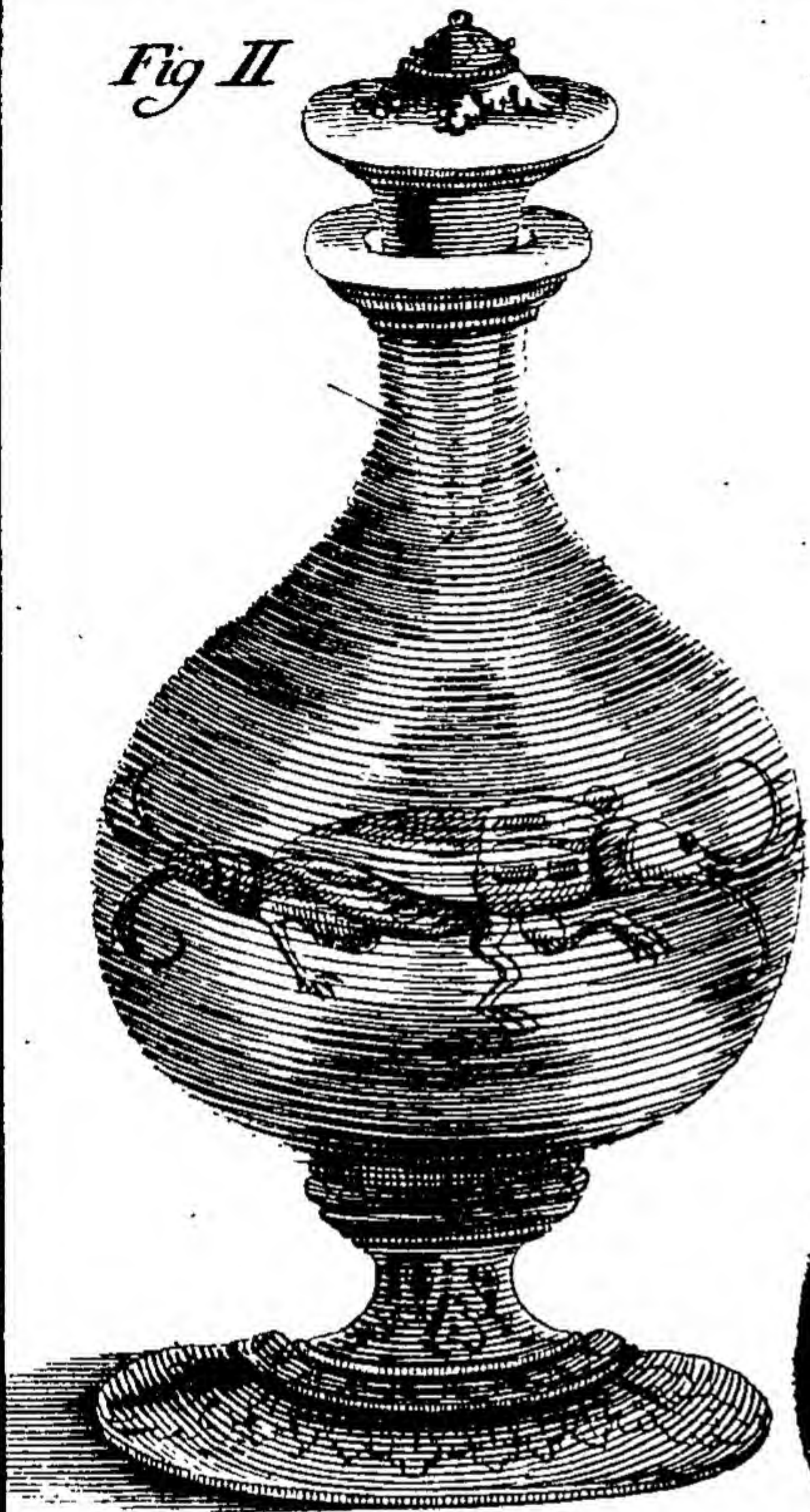
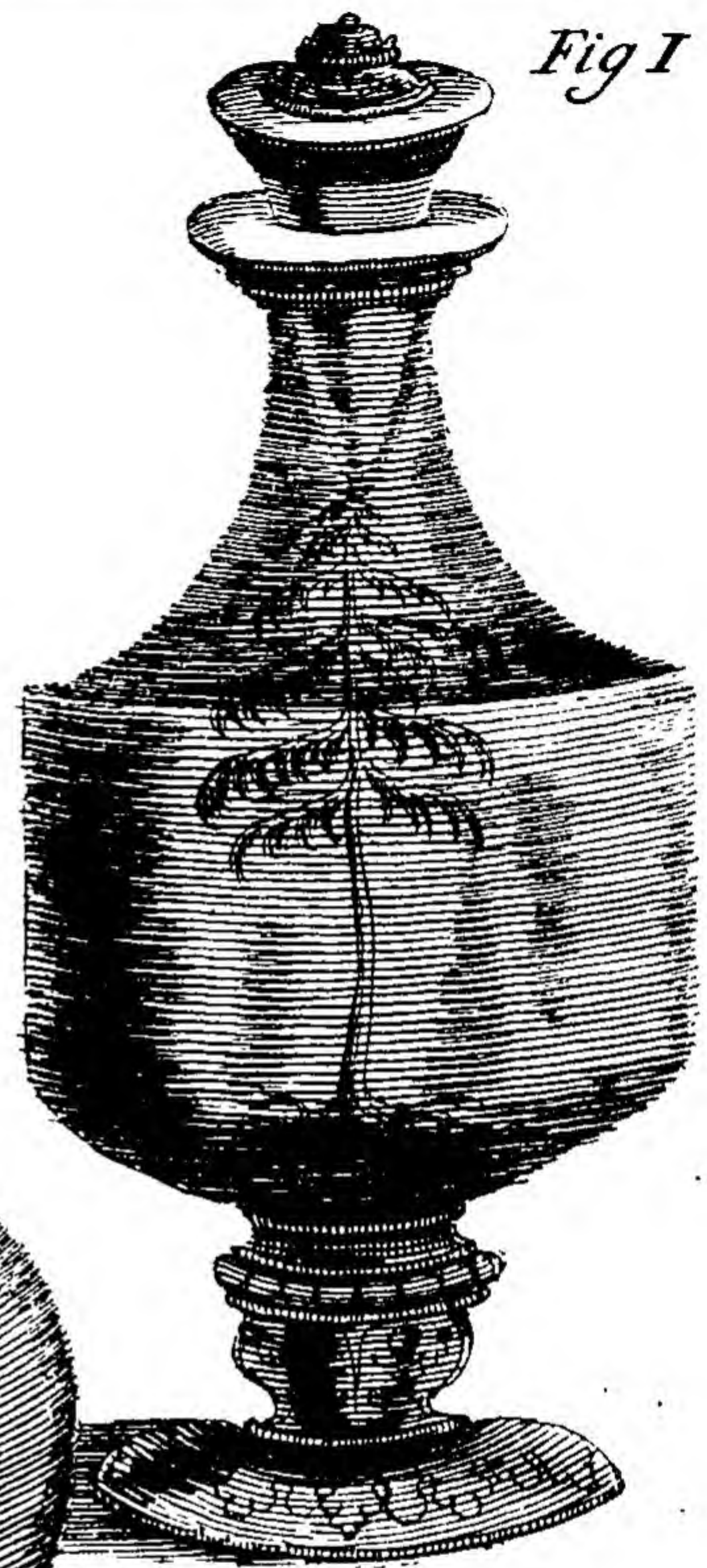
Fig. I. *Is an artificial Pine, which was formerly so tall, that it seem'd to reach the Clouds; but is at present very small, being reviv'd from its Ashes, with all its Parts, and presenting it self as a Shadow on Paper; but is capable, if requir'd, of being dress'd in all its fine Colours without disappearing.*

Fig. II. *In this Glass is enclos'd a particular Species of Crayfish; I took this rare little Animal, myself, at Ehebetten, a Village about three Quarters of a League from Ratisbonne, as I was operating upon some Trees in the Wood, where they may be found in great Plenty, but elsewhere are scarce and unknown; they are very wild and fearful; and as soon as they perceive a Man a-*

far off, endeavour to escape. This little Creature is of the Length and Thickness of one's Finger, of a brown Colour, and a little yellowish on the Belly: It has a large bearded Mouth; and therefore is called by some People the Land-Crayfish: It has two large prominent Eyes: Its Neck is cover'd with a kind of Armour; as are its two Claws before, which somewhat resemble Elephants Paws: On the Back it has two Wings; and at the Tail a long Prickle; and on its Sides two others, short, and very sharp-pointed. At first I had in my Head to burn and convert it to Ashes, and to raise it again artificially; but when I consider'd that it would not appear again to me perfectly in this Form, I chose rather to place it here, where it will be more permanent, and where it may be contemplated more leisurely.

Fig. III. Shews how a little naked Man may be produc'd in a Glass with a perfect Body, which being of a very delicate Texture, will not allow of too rough a Touch; but if you pass your Hand over him gently, you may feel a very smooth Skin: He is durable in his Form, and never disappears. This will be a diverting Ornament in a Garden.



Fig II*Fig III**Fig I*

PART I. SECT. II.

CHAP. I.

Of the Multiplication in general of all TREES, SHRUBS, and FLOWERS, as God Almighty has ordered it in the Course of Nature.

§ 1. **T**HANKS be to God, we are certain, not only by the Holy Scripture, but also by common Sense and Reason, that the Wise and Almighty Creator has made all Things both in Heaven and Earth; and that he continually preserves them in the same Order he first settled them in; for that Reason St. *Paul* seems so warm against the Heathens in the first Chapter of his Epistle to the *Romans*, because in so visible a Work of God as Creation is, they did not acknowledge his invisible Being, eternal Power and Godhead, as well as the full Power of a Lord, who has so wisely, and in a way so far above the Reach of our human Understanding, disposed every thing; and thought themselves no way beholden to him for such an excellent Piece of Work; not praising or glorifying, much less worshipping and serving his Divine Majesty; for all which they will have nothing to say for themselves, and never will be able to justify their having in his stead adopted ridiculous Fables, that turned them so far out of their right Senses, as to mistake the foolish Likeness of mortal Men, for the Excellency of an ever living, most holy, and most glorious God, and to serve the Creature before its Maker; tho' he has made Man for no other End, but to give his Supream Majesty both Glory and Praise every

very Day, and every Minute of the Day. Several Philosophers, and other Pagans, seem, in a manner, through the common Light of Nature, to have been sensible of the Appearance of an eternal Architect in those wonderful Creatures so beautifully fram'd, and which it is so much out of our Power to measure; they praised him, and gave the World a *Latin* Name, signifying a wonderful Beauty and Neatness (*viz. Mundus quasi à munditie*) but their want of a perfect and distinct Notion of the true living God, and of his Being, threw them into many foolish Errors. An Instance of this is *Aristotle*, who observing the Stateliness of the Universe, and holding every thing to be incorruptible and permanent, thought the Universe was Eternal; and that therefore this World neither had a Beginning, nor was to have an End: But it may be forgiven him, if we consider he was too far engaged in abstruse Speculations. A famous Philosopher of our Age, in the delivering of his Thoughts about the World, would fain have used the Word *Infinite*, had he not been afraid of injuring Supream Divinity; this made him use the Word *Indefinite*, as an Instance, that this System of the World, which is so great, and so full of Mystery, can never be sufficiently apprehended. Others have been of Opinion, that there might be more than one Earth and one World. Nay, some Christian Philosophers have come very nigh the same Sentiment; for they thought that the Moon and the other Planets ought to be look'd upon but as so many terrestrial Globes, wherein, *Men, brute Animals, Fields and Woods* were to be found: But there being no Proofs of this, either in the Book of *Genesis*, or from Nature, therefore it is at the most but a Philosophical Speculation.

§ 2. There have been also a great many very learned Philosophers, who owned, that indeed God had created the World, and all it contains; but would also enquire from what, how, and when he had created it. It is wonderful that so many of the Learned Moderns have had the same Thoughts with Heathens, with-

without considering that God at first created a *Chaos* or *Mass*, without any Form, Figure, or Order, which the Spirit; *who moved upon the Face of the Waters*, made fruitful and productive of living Creatures: Whereas Creation is the producing of Things out of Nothing, which is a constant Truth, tho' an incomprehensible one. Some also have endeavour'd to find out, whether God has made the World round, square, or oval; which is a Question both inscrutable and unnecessary. The Arguments of those who will have it to be square, are pretty well known; but the most part of Mathematicians are of Opinion, that it has a spherical Figure; and they give such good Reasons to ground it upon, as admit of no Contradiction. Others suppose the oval Form, and back their Sentiment with very weighty Arguments. Those who take the World to be like an Egg, look upon the Sky as the Shell, which covers and compasses all; the Waters and Seas they say are the White, and the Earth is the Yolk, pretending that Man is the little living Point, for whose sake both Heaven and Earth were created; but these are still nothing but Fancies and Chimera's: For that reason *Gassendi* values *Epicurus* for his Modesty, in not explaining himself too freely upon the Figure of the World, as knowing it was not possible to find it out. More than that still, there have been several so inquisitive, as to mark out the Time when, and in what Season God made Heaven and Earth: Those who think it was in the Spring, ground their Opinion upon the 12th Chapter of *Exodus*, where it is said that God commanded the *Jews* to begin their Year with the Month *Nisan*, that is, in *April*; and upon the 1st Chapter of *Genesis*, where it is said, that the Earth brought forth *Herbs* yielding *Seed* and *Fruit-trees*. Now it is true, that such an Opening of the Earth falls out in the Month of *April*; therefore it follows, that the Creation of the World was performed in the Spring; but those who pitch upon the Month *Esul*, or *September*, go upon other Grounds; they say that the *Fruits* of *Paradise*

radise were the only Food of Man; and that *Adam*, as soon as he was created, was forced to look for a proper Food. Now the Month of *September* yields the best *Fruits*, as every Body well knows; and the following Verse shews it;

Poma dat & gratos September ab arbore fructus.

September gives *Apples*, and other pleasant *Fruits*: From thence they conclude, that as all *Trees* were loaded with *Fruits*, so it must be that the Creation fell out in Autumn. But a true Christian ought to have nothing to do with such Speculations, the Creation of all Things being the Master-piece of a Power, not only infinite, but also above the Capacity of Man to describe, and so perfect, as to surpass all human Understanding.

For, in short, every thing was made out of Nothing, and Nothing wants neither Time nor Season. God created Heaven and Earth from Nothing; and made both the Moveable and the Unmoveable.

Whether, by that Moveable, may be understood the Spirit of God, which moved upon the Face of the Waters, mentioned in the Book of *Genesis*, 'tis very hard to agree upon; tho' *Ortelius in Epilogo & recapitulatione in novum Lumen Chymicum Sendivogii*, be of Opinion, as may be seen in *Theatro Chymico, Vol. 6. p. m. 432.* that those were far from the right Mark, who thought the Spirit of God which moved upon the Face of the Waters was the Holy Ghost, because this *Spiritus Elokim* was an Emanation from all the three Divine Persons.

But the Learned Dr. *Daunbauer* refutes this Opinion in his *Hagiologium Festale, pag. 1029*, where he thus explains that Phrase; The Spirit of God, which moved upon the Face of the Waters, was certainly no created Spirit, neither was it an Archangel, much less a Wind, (as somewhere else a strong Wind is indeed called a Wind of God in the holy Scripture) but it

was

was the Breath of the Mouth of God, *Psal.* 33. 6. This did not move in vain, and to no purpose, but with a vivifying Virtue acting without, as a Bird which hatches her Eggs, to use the same Comparison as is hid under this. In this World, as in an Egg, the Spirit of God everlasting and every where present, that holy Spirit has placed, vivified, moved, formed, framed, and fertilized all Things both in Earth and Waters, from which spring up Millions of living Creatures, as many as there are upon the Face of this Globe; and thus were all Things made out of Nothing in Six Days.

But let us give all this over to the Divines, or else it will be thought, that instead of a Discourse upon *Trees*, I have a mind to multiply Theological Disputes; but the Reason why I have touch'd upon this Subject is, because it will serve as a Basis to the second and third Part of this Work; mean while every Body is hereby warned, especially those who take any Delight in *Gardens*, to frame no Article of Faith out of what I have imparted them. I only write for their Diversion, that walking in a *Garden* with my Book in their Hand, it may furnish them with all manner of Thoughts. But I'll never be at the Trouble of proving what I say, my printed Works containing nothing but what has either Truth or Likelihood in it. I'll never wilfully say or write any thing that is unjustifiable, or against my Conscience: Neither do I design any harm to any Body, as being of no Advantage to me; let us rather go on in the Enquiry about our active Element, or first Principle which I began to treat of.

§ 3. Having Occasion for an universal Mover, I made choice of the *Light*, which God created the very first. It has been warmly disputed, whether it be a substantial or an accidental Being; the World, for the most part, embrace the first Opinion; tho' Accidents be also created Things. Now if it had not been a Substance, it never could have lasted till the third Day; which makes it hard for me to comprehend how any one can imagine

that God created *Light* after an uncommon manner as an Accident, and preserv'd it so long. At least, I think it is not repugnant to Reason, and that I don't speak contrary to Nature, when I say that God created the first *Light* as a substantial Being, to which Divine Majesty it self is very often compared, and which, of its own Nature, is in a perpetual Motion, and acts continually as a Being subsisting by it self. This may very well be believ'd, since all the Affections and Qualifications requisite for a substantial Being are found in it. But there is another Dispute among Philosophers, which is not yet like to end, Whether *Light* be a Creature different from the *Æther*? *Descartes* admits of no Difference; and his Arguments seem to carry a great Weight, as may be seen in his Works. But my Reasons for the contrary Opinion are such, as to make me leave that Philosopher, for those who take *Light* for somewhat distinct from it; the Chief of which is, that in the Book of *Genesis*, *Light* is positively nam'd as a distinct Creature; for *Light* was before there was any Man; *Light* was not created in the Man's Eyes when he was first created himself, as that Philosopher will have it, but it came to him from without; for when there is an illuminated Body, the Eye is first sensible of that *Light*. Now any Body may easily think that the first created *Light* must needs be different from the ordinary *Light*, as well as from the Fire; for the former is justly to be reckon'd among the Elements as being the most pure, and the most free from all heterogeneous Parts; but *Fire* is no more esteem'd as an Element, which being made up of sulphurous and saline Parts, for that reason wants Fuel, which *Light* does not: *Fire* can't burn whenever the Air is not at a full Liberty to act with it, but goes out: But *Light* spreads it self over Millions of Leagues in the Air. The Elementary *Light* is rather cold than hot; but common *Fire* and *Light* is hot and scorching. Things being thus, who will not grant that the first *Light*, which it self subsists, is something substantial; yet let any Body under-

undertake to prove the contrary, I'll never oppose or contradict him.

§ 4. There is still a very intricate Question to be resolv'd, *viz.* Whether the *Light* be the universal Soul, and general Mover of all Things, being appointed by God to act according to the Laws of Nature? I answer in the Affirmative, not knowing better; but if any Body understands this Matter better than I, he is very welcome to give his Opinion: After all, I have sufficiently explained elsewhere my Opinion, that all Matter, tho' never so refin'd and subtile, wants a motive Principle; and if I say once more, that such a Principle is Immaterial, I may meet with many Opposers; for the Answer is always ready, *viz.* by Consequence 'tis Immortal. If I say it is Material, and at the same time ascribe to it so many surprising Performances, Effects and Virtues, I shall be laugh'd at as one who knows better than he writes. I shall therefore take the middle way, between the two Extrems, and say that *Light* is a Being both Spiritual and Elementary together; tho' this will be as hard a matter for me to prove, as for any one to make me sensible what the intelligent Soul is, and how it is united with the Body; and also how by vertue of its intimate Conjunction with it, it both acts and suffers in it.

§ 5. Created *Light* is a Substance, which has spread it self over the whole Expansion of the Heavens, as well as above and beneath the Earth; for *Light* was before any *Grass*, *Plant*, or *Tree*. We read in *Genesis*, Chap. 1 and 2, that God commanded the Earth to bring forth; on which occasion we may take notice, that it is not said, God caused this or that to be brought forth; but *God said, Let the Earth bring forth Grass, the Herb yielding Seed, after its kind; and the Fruit-tree yielding Fruit, after its kind, whose Seed is in it self upon the Earth, and it was so; and the Earth (which is to be observed) brought forth Grass, and Herb yielding Seed, after its kind; and the Fruit-tree yielding Fruit, whose Seed was in it self, after its kind; by which*

Words one may easily see that God did not make *Grass*, *Plants* and *Trees* grow, but that he only gave his Order to that Being, whose Office it was to put the Almighty's Word in Execution; for the Earth, considered meerly as Matter, had no Motion of it self, but was and is a mere passive Being; therefore that motive Principle, to which the Execution of the Laws and Orders it had receiv'd was committed, was then already in the Earth. Whereas *Moses* expresses himself quite otherwise; when he says, That God had planted a *Garden* in *Eden* towards the East, and therein plac'd the Man whom he had made; which shews that that *Garden* was not so created by God, but was made by him; the Word *planted*, denoting a Work done with Hands; and that the Lord having at first ordered the Earth to bring forth all sorts of *Trees*, both pleasing to the Eyes, and yielding *Fruits* good for Food; he no more bid the Earth to do it, because every thing was come forth already; but he would shew the Man a sudden Growth to please his Eye; God having, as may be said, caused the *Tree* of Life, and that of Knowledge of Good and Evil, to grow suddenly in the Middle of the *Garden* before his Eyes, that they might appear to him with all their Parts, as well as their respective *Fruits*. It may be therefore rightly supposed, that had the State of Innocence of Mankind in Paradise lasted longer, *Trees* would have been quicker in attaining their full Bigness and Growth, than they have been since the Fall, for which both the Earth and its Productions were cursed; so that all *Plants* shoot and grow very heavily; tho' Men are still as eager as ever to see a *Tree* suddenly grow up to its full Heighth. Thus a great many People have thought, and were in hopes I could presently make a large *Tree* of a *Twig*, tho' it never enter'd into my Thoughts when I spoke of the Encrease of *Plants*. I was not a little shock'd, when I read a certain Passage in a little *French* Book concerning this Matter; which is as follows.

Amongst

Amongst all the Discoveries made in Matters of Learning for these hundred Years, there is not one so advantageous to the Publick, as that which a Learned German speaks of in a Letter he sent me, dated the second of February.

An ABSTRACT of that LETTER.

‘ *S I R*, - - - - I hope you will not take it amiss, that I acquaint you with a Discovery which has very surprising Effects; the World (especially Princes and wise Men) will take it kindly of you, if you let them know it, by inserting it in your Journal so well known all over *Europe*, &c.

‘ A Physician, as well as profound Naturalist of *Ratisbonne*, has printed off some Sheets, wherein he informs the World of a Secret relating to *Agriculture*, which he calls *Mumiam Vegetabilem*. He boasts of being able, out of a single *Tree*, whether common with us, or *Exotick*, to make as many more of the same kind as it has *Boughs*, *Shoots* and *Buds*; and that every one of those new *Trees*, in less than an Hour shall have *Roots*, and shoot both *Branches* and *Leaves*, which will be seen to grow so speedily, that the very same Year they will not only blossom but bring *Fruit*.

‘ By the Means of that wonderful Secret he makes every *Twig* or *Sprig* of *Lemmon*, *Pomgranate*, or other *Trees*, shoot out large *Branches*; and that also to a very amazing Heighth: he uses the same Method, and with the same Success, for the *Flowers* and *Shrubs*, which *Gardens* are commonly adorned with. This Secret is not a mere Imagination; for the Inventor of it, on the 4th of *December* 1715, made the Experiment before the Count of *Wratistlaw*, and several other Noblemen, which had a surprising Effect; I shall only relate here what may be found in the Advertisements, which that Physician has printed for the Publick.

‘ *First,*

‘ *First*, Out of twelve small *Lemmon-Trees* he made as many
 ‘ great ones, every one of which had its *Roots*, *Branches* and
 ‘ *Leaves* in proportion to its Bigness.

‘ *Secondly*, He made the next Experiment upon Six *Trees*, of
 ‘ a different kind from one another; such as *Apples*, *Peaches*,
 ‘ *Apricots*, that had but four or five Foot in height; he con-
 ‘ verted them immediately into large *Trees*, perfectly well fur-
 ‘ nished with *Roots*, *Branches* and *Leaves*, and put them in such
 ‘ a Condition, as to be able to blossom and bring forth *Fruits*
 ‘ this Year, 1716.

‘ *Thirdly*, He made the third Experiment upon fifteen *Slips* of
 ‘ *Carnations*, of which he made large *Plants*, that were seen to
 ‘ grow with Pleasure and Amazement to the Beholders, espec-
 ‘ ally when they considered that Learned Physician had made
 ‘ these three Experiments in the space of one Hour.

‘ At length this skilful Naturalist shew’d the Count *de Wra-*
 ‘ *tislaw* sixteen *Trunks* of Forest *Trees*; such as *Pine Trees*, *Oak*,
 ‘ *Beach* and *Birch Trees*, from seven to nine Foot in Height,
 ‘ which he encreased in the space of six Hours, to the Bigness of
 ‘ great *Trees* that had attain’d a full Growth, and could very well
 ‘ pass amongst the largest of *Trees* in any Forest.

‘ That Author treats at large in his printed Works of the
 ‘ Advantages his rare *Vegetable Mummy* may be of to the Publick,
 ‘ through the Means of which, in a very little while, any sort
 ‘ of *Plant* may be multiplied.

‘ According to his Computation, he makes appear, that in
 ‘ four and twenty Hours, with very little Trouble, seven hun-
 ‘ dred fourscore and twelve *Trees* may be produced; and in
 ‘ eighteen Days, only working seven Hours *per Day* with dili-
 ‘ gent Workmen, a whole Forest may be produc’d, containing
 ‘ six and twenty thousand and sixty *Trunks* of large *Trees*.

‘ That Physician offers to impart his Secret to all Princes and
 ‘ Noblemen, whose Generosity will make amends for the Trou-
 ‘ ble

‘ ble of such an useful Invention; but at the same time he says
 ‘ he will be contented, in case the Reward be only deposited in
 ‘ the Hands of some indifferent Persons, till he may have un-
 ‘ answerably proved what he has promised, and what he actually
 ‘ performs by Fire, with which he always assists his *Vegetable Mum-*
 ‘ *my.* I am, S I R, &c.

‘ P. S. If such a Secret could make up the Losses a great ma-
 ‘ ny People have sustain’d, by the Severity of the Winter, in
 ‘ their *Gardens* and *Orchards*; or that we could by its Means
 ‘ raise Forests in *Champaign*, and other Countries that are bar-
 ‘ ren of Wood, it would be of equal Value with the Philosopher’s
 ‘ Stone; but let it be as it will, that Physician makes a very rea-
 ‘ sonable Offer, since he demands nothing before-hand, besides
 ‘ a Note for his Security, to intitle him to the Reward he will
 ‘ so justly have deserved, if he teaches his sudden way of multi-
 ‘ plying all sorts of *Plants*; the Experiment of which he promi-
 ‘ ses to make at his own Cost. The only Doubt is, Whether
 ‘ those *Plants*, whose first Step towards their Encreasing is oc-
 ‘ casion’d by the Warmth of a moderate Fire, can maintain
 ‘ themselves by Nature only, or must be supported by Art; for
 ‘ in the latter Case it would be a thing more curious than useful.

I do here declare in the most solemn manner, and highly pro-
 test, that all this, if it relates to me, is false, as having never
 thought of such a sudden Encrease; and having only aimed at an
 universal Multiplication, which I have not only demonstrated,
 but endeavoured by degrees to carry it to the highest Pitch of
 possible Perfection; for every Body knows, that whatever grows
 so of a sudden, being forced to it by an Art above Nature, is sud-
 denly spoiled, and cannot last long. But since I am put in mind
 of it, and it seems the Publick expects so much of me, I have
 said in the first Section, that if it please God, I intend to make
 an Experiment of it hereafter with the Mercurial Salt, and I won’t
 fail,

fail, presently after, to impart it to the World. Therefore it will be sufficient, if I say here once more for all, that I do not mean any other Multiplication besides the universal one, which is constantly performed in and by Nature, and never contrary to it; so that I leave it to him, who has written that of me, and has either not read, or will not understand those Matters, to explain his Meaning, and to answer for himself. As I am now speaking of Nature, I think it proper I should explain its different Acceptations, that so false Ideas may not be framed about it. Thus shall I think my self fully justified, in case any Body would force a Sense upon my Writing which I do not mean, and father a Design upon me, which I never thought of.

§ 6. The Word *Nature*, not only in this little Performance of mine, but also in those of the most Learned, has a great many Acceptations. First of all by *Nature* God himself as Creator of all Things is understood; he is *Natura Naturans*; for all Things come from him; they are all in him; and they all move, and are moved at his Will and Command; there being none besides him to sustain and rule them. Thus when it is said there cannot be in *Nature* a Want of necessary Things; it is the same, as if we were to say, that God is so merciful, as to let us want for none of those Things that are necessary for our Subsistence. Thus is God understood by the Word *Nature*.

Moreover, by the Word *Nature* is understood, whatever is in the whole Universe, as well above as under Heaven; above or under the Earth; in the Waters, and in the Air; nay, in all the Elements: And when it is said that *Nature* never grows old, it is thereby given to understand, that the World has no natural Tendency towards its Decay. The Sun, the Moon, the Stars, and the Elements, the Earth, and the Sea, neither grow old, nor suffer any Corruption by *Nature*, but are steady and permanent; and tho' the Earth is a little altered since the Creation, yet it never went so far as to be corrupted. The Word *Nature* is besides

sides very often accepted for the Constitution or Temper both of Men and other Things; it is used also for the Qualifications or Virtues which God bestows upon 'em. Thus we say it is in the *Nature* of that *Man*, or of that *Tree*, which is as much as to say, this is *natural* to that *Man*, or that *Tree*; for they neither of them can do, or produce any thing but what is agreeable to their Constitution, whether it be hot, moist, or dry.

The Word *Nature* is also taken for the Form, or interiour Being, both with regard to Man and other Things, in which we find Life and Motion: As when we say, *Nature* moves gradually in her Work; our meaning is, that the Form or Soul, which is within, does not carry all Things at once to the highest Perfection, but proceeds from Imperfection to the most perfect Degree. It must be allowed that Things grow by little and little; for it can never be, that a large *Tree* should be produced of a sudden from a *Bud* or *Twig*, or from a Bit of *Root*, or a little *Seed* of another *Tree*; and we don't see that Men are born as big as Giants.

Lastly, The Word *Nature* is also taken for the Form and Matter together; as when it is said *Nature* goes beyond Art, it signifies, that when we examine the interiour as well as the exterior Parts of a Thing, we find that *Nature* can perform something better and more excellent than Art can do. This is what I thought fit to mention in this Place, for several material Reasons.

§ 7. But let us now return to our former Subject, and direct our Thoughts towards Paradise, where *Adam* appears full of that peaceable Joy a righteous Soul meets with in the Contemplation of *Nature*. Methinks I see him busying himself about the universal Multiplication of *Trees*, *Shrubs* and *Flowers*, by the help of the *Seed* which he gathers from all *Plants*, every one yielding such as is natural to its kind, but in such a prodigious Plenty, that he does not know what to do with it; so that he keeps

it for his Use, as we shall see by and by; and if we his Posterity have a mind to draw a rough Sketch of that unspeakable Plenty he enjoyed in Paradise, let us but consider what *Nature* still gives us to this Day, tho' the Earth has been under a Curse ever since his Fall; for one single Grain of *Seed* often yields us above 360000 other little Grains; and when we sow them again, they bring such an excessive Number, as amounts to above 129600000000 Grains; but if such a piece of Husbandry was continued for fifty or a hundred Years, there would be such a Number of them as it would be almost impossible to express, and never could be comprehended, as may be seen more at large in *Elzboltz's Book of Gardening, pag. 23.* If our Days still afford Examples of such a prodigious Multiplication, how unspeakable must it needs have been in the State of Innocence? Meditating further upon those Matters, methinks I see how *Adam* and *Eve* regularly employ'd their Time in sowing the Overplus of the *Seed*, which they gathered, beholding with an uncommon Pleasure the *Seed* shooting at the same Instant it was cast into the Ground, and in a few Days blossoming, and producing *Fruits* perfectly ripe: And how, when they had gather'd them, and taken out the *Seed*, and return'd it to the Ground, those *Fruits* still acquir'd a more delicate Taste; whence it is an easy matter to judge with what Eagerness they must have long'd for the forbidden Fruit. O happy Times! for then *Adam* and *Eve* beheld and rejoyced in the sudden Growth of their *Plants*, while we have it hidden from us. As for us, we too often see and experience, that when we take the *Seed* of the finest *Fruits*, and sow it in the Ground, tho' it shoots leisurely, and grows by little and little, yet after we have waited a long while in Expectation of delicate *Fruits*, we have nothing but sower *Apples* or wild *Pears* for our Trouble. But here I stop a little, to consider the Shortness of that glorious and happy State which *Adam* himself enjoy'd: It vanish'd in a Moment; his free Will and his Pride

not

not being kept within due Bounds, threw him headlong into utter Misery from the highest pitch of Felicity. He would act according to his Pleasure, and be like God himself; and tho' he at the same time knew he should be under Sentence of Death, the very Day he should eat of the *Tree* of Knowledge of Good and Evil; yet he had the Assurance to break through the severe Command: and the same happens but too often every Day to our Sorrow. Whatever can be said or argued upon that Matter, we will not be confined, but will indulge our Desires, and please our Palates, tho' we be convinc'd that nothing but Death can be the Consequence. We take but too much after our first Parent in that respect.

§ 8. Before I leave this Subject, I have a curious Query to propose, *viz.* Whether the *Tree* of Life and Death, which *Adam* and *Eve* eat of, was a *Fig*, or an *Apple-tree*; chiefly because the Man, immediately after his Fall, applied himself to the *Fig-tree* for its *Leaves*, and sewed them together to cover his Nakedness; and not only so, but likewise to shew his Sorrow, and to undergo a sort of Penance for his Sin: For the *Leaves* of the *Fig-tree* are large, hard and rough, and consequently by the Uneasiness they gave, were a fit Punishment for Sin; as is set forth in *Cardiluerus's* Work. That Author gives another Reason besides this, to prove that the forbidden *Tree* was a *Fig-tree*, *viz.* That the Lord Jesus cursed that *Tree* before his Passion, as tho' it had been on purpose to shew us it was the Cause both of Man's Fall, and of his being ready to suffer Death. But this does not seem so very agreeable to Truth; for we read in the third Chapter of *Genesis*, that the forbidden *Tree* was pleasant to the Eyes, and a *Tree* to be desir'd to make one wise; all which don't seem to belong to the *Fig-tree*. However, one might say there is a great Mystery conceal'd under the Command we have to look to the *Fig-tree*, and that it ought to be well observed. We may suppose also, with some others, that the forbidden

Fruit was a certain sort of *Apple*; God having distinguish'd *Apples* in a very particular manner, for if you cut an *Apple* cross-way through the Middle, you will commonly find ten Marks, according to the number of the Ten Commandments, to shew it was the *Apple* that gave Birth to those Commandments, as it was the Occasion of *Adam's* Sin. There is also a sort of *Apples* to be found, called *Adam's Apples*, wherein we may observe such Marks, as if a Man's Teeth were printed in them, as the above-mentioned Author relates it.

In short, let *Adam* have sinned by eating of an *Apple*, or of any thing else, it is certain that he was driven out of Paradise; and that among other peculiar Felicities which he enjoy'd there, he lost the Pleasure of that speedy Growth and abundant Multiplication, which Nature yielded in the State of Innocence: Therefore leaving this Subject, I shall proceed to examine how *Adam*, after his Fall, undertook the Multiplication of all *Trees*, *Shrubs* and *Flowers*; and how all his Posterity, and even the holy Patriarchs themselves, were oblig'd to follow the same Method; as will appear by the following Chapter.

C H A P. II.

Of the Antient Way of Multiplication, which Adam and other Patriarchs made use of.

§ 1. **T**H O' *Adam*, and every one of us in him, were depriv'd of Paradise, with its delightful *Garden*, yet there still remain'd in his, as well as in our Nature, a Propensity, or natural Inclination to *Gardens* and a Country Life: God having

having at the Beginning appointed Paradise for the Dwelling-place of Man, and design'd all sorts of *Fruits* for his Food. And we still find in our *Gardens* a pleasing Resemblance of that glorious Paradise, sufficient to charm our Senses, and to raise and invigorate our Spirits. We see at different times of the Year, in a neat and well kept *Garden*, *Tulips*, *Anemonies*, *Hyacinths*, *Auricula's*, *Roses*, *Lillies*, &c. and when the Autumn is a little further advanc'd, we have *Beazart Carnations* most surprisngly variegated with fine Colours; the *Picotées* so artfully spotted, and *Flakes* with their two Colours so finely intermix'd, as almost to dazle our Eyes. If we take a Turn in the Walks among the *Trees*, our Ears are diverted with the warbling of little Birds singing as they flutter about from *Bough* to *Bough*, and seeming to rejoyce at the Works of their Maker. Besides this, we hear the pleasant whispering *Zephyrs* fanning the Air among the *Leaves*. If we go into any *Green-house*, how are our Senses captivated with the beautiful Varieties of sweet-smelling *Trees* and *Flowers* from foreign Countries, even to an Ecstasy. When finding our selves tired, we have an Inclination to lie down upon some grassy Bank, shaded with an *Apple-tree* well loaded with *Fruit*; how pleasant is it to see the *Apples* hanging over one's Head, speckled with red and yellow Colours! And what Entertainment is it for our Palate to taste and relish those excellent *Fruits*! In short, there is so much to be said, both as to the Agreeableness and Usefulness of *Gardens*, that they are Subjects not to be exhausted.

§ 2. Mean while, since in our fallen State God is still so merciful, as to grant us so many fine and wonderful *Plants*, so many pleasant and delicious *Fruits*, we are in Duty bound to praise him, and return him eternal Thanksgivings. The Consideration of what is still left us, ought rather to raise in us a strong Desire of everlasting Things, than to infuse an Inclination to look back after those we have lost by the Fall. The Sight of a *Garden* ought

ought to inspire us with the Thought of imitating *Adam's* innocent Life whilst he was in Paradise.

Let us for a Moment reflect upon the Condition of our unfortunate Parents, after that dreadful Sentence which put an End to their Happiness. Their Want of Food put them upon the Search of proper *Fruit* for the Support of their Lives: It had then no more that Sweetness, that delicious Relish, that charming Beauty; nothing was now within their Reach but sower and insipid *Wildings*, *Thorns* and *Briars*. What a strange Food for two Persons, who were but the Moment before enjoying the highest Pitch of Felicity, and the greatest Plenty imaginable! Then had the unhappy *Adam* occasion enough to study and apply himself to that *Agriculture*, which he had practised in Paradise. His Experience of a sudden Multiplication and Growth, without doubt, put him upon renewing this Tryal; but neither the *Earth* nor the *Seed* was any more under his Command; Time and toilsome Labour must now force it out of the Ground, and Care and Solitude contribute to the Supply of his Wants.

Eve proved with Child, and was brought to Bed of a Son. Amidst the Transports of their Joy, she thought the Divine Promise began to take Effect. I have gotten, said she, a Man from the Lord, the *Seed* that will bruise the Serpent's Head; but alas! she was deluded, through the Earnestness of her Desires; it prov'd the first Murderer *Cain*. When that Child began to grow, *Adam* taught him how to improve a *Garden*, and exercis'd him in other Parts of *Agriculture*: He taught him how to gather the *Seed* in a fit Season; then how to sow it again; and lastly, how he was to keep it; and when it began to grow, what Care was to be taken of young *Plants*; what Observations were necessary as to the Difference of Weather, and the Changes of the Moon; what manner of Help and Assistance he was to give those *Plants*, that they might both grow and ripen in as little while as possible,
and

and such like necessary Things; and when at last, *Cain*, by his Diligence, Trouble and Labour, was come so far, as to reap the *Fruits* of the *Trees* of his own planting, he went about to offer them to God as *first Fruits*, for an Acknowledgment of his Goodness, in having blessed his Labours. To that end he built an Altar, cut down Wood from the *Trees* he had planted, and gathered whatever he had occasion for in his intended Offering. *Abel* did the same, and offered of the Firstlings of Sheep, and of their Fat; for the Law of the *first Fruits* was then the same with what was afterwards inserted in the written Law, *viz.* that the Male Firstlings of the Cattle that were without Spot, should be offered to God. The Wood, and whatever else had any relation to Sacrifices, was to be of the *first Fruits* too, of their own planting, produc'd immediately from the *Seed*; for if the *Trees* had been rais'd any otherwise than by means of the *Seed*, *viz.* by Grafting, or such like artificial Ways (supposing they were then known) they would not have been admitted of in the Sacrifices, as not being *first Fruits*, as may be concluded from the History of *Abraham*, when he went about to offer his Son *Isaac*; for he not only took the holy Fire along with him, three Days Journey, but caus'd the Wood to be carried as far as the Mount *Moria*, tho' he might have found Woods and Forests enough both in his way, and on the Top of the Mount; but because such Wood was to be somewhat particular, that is, of the *first Fruits*, and that he must be assur'd of it, he took both Wood and Fire along with him, which he laid upon the Back of his Son, in order to sacrifice him for a Burnt-offering, as a *first Fruit*, or First-born.

§ 3. That way of selecting the *first Fruits* of *Plants*, was deriv'd next to the holy Patriarchs, and practis'd in the same manner for the same Reason above-mentioned; for after the Flood, *Noah* began to be a Husbandman, *Gen. 9* he took especially to planting the *Vine*, as having occasion for Wine, not to indulge his

his Sensuality, but for the Sacrifices. Those *Plantings* and *Multiplications* being designed for such a holy Use, it was requisite they should be also of the *first Fruits*; and for that Reason *Multiplication* by *Seed* was introduced anew. One is amaz'd to see the prodigious Number of little *Seeds* that may be had from the *Vine*. When I consider how our *Vintagers*, after they have press'd the *Grapes*, cut the *Stalks* to pieces, and throw them away, as good for nothing, tho' there are so many Millions of *Vine-Seeds* amongst 'em, I can't sufficiently wonder at it; for this I have often reprov'd 'em, adding withal, that they should reflect upon the unexpressible Advantage they might get from that *Seed*, which they trod under Feet, and set so little Value upon; and that with very little Trouble, by casting the *Seed* into the Ground in a Field good for little or nothing else, they would have, in a Year's time, many thousands of young *Vines*, which growing by degrees, would be of no small Advantage; they answered me, they should be great Fools to trouble themselves with such Trash. What Pains and what Labour would not such a little *Seed* cost them? and should it spring up, they could not transplant it. Who would be at the Trouble of stooping so much? In short, they told me it was not the Way in their Country. What Negligence, what Laziness is this? And yet it is but what most *Vintagers* and *Gardeners* are guilty of. I shall take particular Notice, in its proper Place, of the extraordinary Profit that would accrue from the delicious *Grapes* which might be produc'd from thence, tho' neglected by those inconsiderate People. But as I have said, so I cannot but repeat it, Our Fore-fathers were none of those idle careless *Vintagers* and *Husbandmen*; they took an extraordinary Delight in planting and dressing *Vines*, and other *Trees*; and they did not think it a Trouble to raise *Fruit-trees*, tho' from the smallest *Seed*. *Abraham* planted many *Trees* at *Beersheba*; and he took Care not only to have Fuel for the common Want of his Family, but also

also other *Trees*, both rare and necessary, either for the Burnt-Offerings, or other Ceremonies of Religion. We read, *Exod.* 30. that the holy Ointment was to be made out of all sorts of Spices; such as the purest *Myrrh*, odoriferous *Cinnamomum*, *Calamus*, *Cassia*, and sweet *Olive Oil*; and when the holy Perfume was to be made ready, they were to take *Balm*, (which doubtless was the *Opobalsamum*) *Myrrh*, *Galbanum*, *Frankincense*, &c.

§ 4. Therefore the Religious Worship requiring such a large Quantity of those *Aromatics*, there is no doubt but *Abraham* and his Posterity were very diligent in the Multiplication of those *Trees*. There is no doubt neither of their having kept a watchful Eye upon them, especially the *Myrrh-Trees* and the *Shrubs*, which produc'd the *Opobalsamum*. It also clearly appears that their *Multiplication* was effected only by means of the *Seed*, which God had particularly design'd for that end at the Creation: For if they had not rais'd *Myrrh-Trees* from the *Berries*, they never could have gathered the *Juice* of *Myrrh*, which is a Balsamick *Liquor* dropping from young *Myrrh-Trees*, when but three or four Years old; had they been older, they could have had no more of that noble *Liquor*, but only the *Myrrh*, which is as a clear transparent Drop; and, when breath'd upon, appears of a reddish Colour. *Pliny* giving a Description of the *Myrrh-Tree*, says it is a *Plant* not exceeding five Ells in height; therefore had not *Abraham* been very diligent in raising young *Trees*, and had he by Consequence wanted *Myrrh*, the Composition of that holy Perfume could not have been right, or according to Prescription; for what was extracted from the *Tree*, as by Force, was not fit to be used in that holy Work; it was also requisite it should be of the purest *Myrrh*, such as that of the young *Trees* was; for it freely distill'd from the *Bark*, which burst of it self; and this only was us'd in the holy Ointment; but the *Myrrh* that comes to us now-a-days is no ways to be compared to this,

as to its Goodness or Usefulness. The same may be said of *Opo-balsamum*, or *Balm*, which is a clear, white, soft, and oily Substance or Juice; but afterwards becomes a little harder, and turns yellowish, having a very fine Taste, and a most sweet Smell; for which Reasons it was also us'd in the holy Perfume.

Prosper Alpinus, who had lived in *Egypt*, and had cultivated some of those *Plants*, says, that *Balm* grows of it self from a *Shrub*, having a *Stem* of about two Ells in length, and little, long, thin, knotty *Branches*, of a reddish Colour; that it is the Custom to cut off the *Branches*, as we do those of the *Vine*; and to bind them up in small Bundles or Faggots, as we have 'em from the *Turks*. The Druggists call this Wood *Xylobalsamum*. When burnt, it casts a most pleasant Odour. The *Seed* consists of little reddish and sweet-smelling Grains, a little smaller than our common *Pease*, they are named *Carpobalsamum* at the Apothecaries. They say the Grand Signior, at the Time of the Conquest of the holy Land, caused all little balsamick *Trees* and *Shrubs* to be transplanted into a *Garden*, made for no other purpose but to keep all sorts of aromattick *Plants*, situated at *Matarea*, about five Miles from *Grand Cairo*, which *Garden* is guarded, one might say, like Paradise, by a Cherub with a flaming Sword. It is a hard matter to determine whether the *Balm* be so good as formerly, or at least, whether it be brought pure to us: Yet some pretend 'tis very probable it is; but that the Grand Signior is the only Master of it, as may be seen more at large in the Book intituled, *D. Valentini Material-Kammer*.

Besides this, *Abraham* planted also that *Cinnamomum*, which most People take to be our common *Cinnamon*; that *Tree* is said to be of the same Bigness and Thickness with the *Lime-tree*, adorned with great large *Leaves* always green, and smelling like our *Cloves*. Now it is pretty well known, that the best *Cinnamomum* is peell'd from the *Trees*, which are but three or four Years old;

old; since the *Bark* of an old *Cinnamon Tree* has either none, or but a faint Scent; for this Reason *Abraham* did not fail to take particular Care of the *Seed*, which is said to be as big as *Acorns* or *Olives*, and to put it under Ground in the proper Season. But I question whether he gathered and peeled off the *Bark* after the same way which *Herbert de Jager* gives a large Description of; and it may be the *Bark* would split and become loose of it self.

The Method now in use for taking off the *Bark*, is thus describ'd. The Season comes twice a Year, in *February* and *August*, at which Times there is a sort of Moisture between the *Bark* and the *Trunk*, that makes it easy to be parted and peeled off. When the Season is come, the *Negroes* and *Cinnamon-Peelers* (for *Negroes* are sometimes employed about this sort of Work) peel off the first and second *Bark*, with a great deal of Care not to touch the third, lest the *Tree* should die; which done, in a Year and a half's time, new *Bark* grows on the *Tree* more tender and fragrant than the former, or than such *Bark* as is peeled off but seldom. As to the manner of Peeling, it is no way different from ours, when we take off the *Bark* of any *Tree*; notwithstanding we see it so shrunk and twisted together: for this proceeds from its being green at first, and afterwards drawn in thus by the Sun, which through its Heat not only adds both to its Taste and Virtues, but gives it a fine reddish Colour; the *Bark*, at its first coming off the *Tree*, being entirely brown and rough.

Neither was the precious Ointment made up without *Calamus*: But this was not our common *Calamus* which grows every where of it self, but odoriferous *Calamus*, which was very scarce, and hard to bring up. 'Tis said to yield a black and very small *Seed*; and as *Pomet* writes, it is not the *Root* which casts such a fine Smell, but the small and jointed *Stalks*, yellow without, and white within, which have a sowerish Taste, mixt with an agreeable Bitterness, and a most delicate Smell, as *D. Valentine* re-
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ports it in his above-quoted Work. Without doubt the *Calamus* planted by *Abraham* was of the best kind, which he spared no Care in raising, in order to make Use of it in the Composition of his Ointment. As to the *Cassia*, which was likewise one of the Ingredients of the holy Ointment, it has no Smell, if we understand it to have been of that kind which is so well known among us. For this *Cassia*, or *Cassia fistulosa*, consists of *Cods* of a Cylindrical Form, and of several Sizes, which are black, hard, and woody without, and fill'd within with a black and sowerish, but at the same time well relish'd, marrowy Substance; therefore it may be thought it was not used among the other Ingredients for the sake of the Smell, but only to give the Oil both a fine Colour and a pleasant Taste. [Tis said also that *Calamus* grows very well from the *Seed*, and is very easy to cultivate and bring up.] As to the *Galbanum*, it always continues soft, and has a strong Smell; and as for the *Frankincense* or *Olibanum*, that has also a fine Scent; and, according to common Report, is gathered near Mount *Libanus*,* from those *Trees*, a whole Forest of which, above fourscore Miles in length, is seen about that Place. The Nature of the *Sweet* or *Olive Oil* is not only describ'd at large by the Authors above-mentioned, but also most of my Readers are pretty well acquainted with that Matter; therefore I shall add no more. It were to be wished we could always find in the Apothecaries Shops, and Druggists Ware-houses, such good and fresh Ingredients as were to be found at that time, and as were ordain'd to be us'd by the Divine Command, we then might prepare better *Balsams*, *Perfumes*, and other *Medicines*; but where what is wished for cannot be had, Custom has introduced *quid pro quo*, or, taught us to supply the Want of one thing with another.

§ 5. Before I consider the Invention of the modern Methods of ordering and encreasing *Plants*, I must not entirely forget the Patriarch *Jacob*: Doubtless he practis'd the *Culture* of *Trees*, and had
good

good Success in it, as appears by several Circumstances; and it may be almost concluded, that he was the first who begun to recede from the natural Way of propagating them by the *Seed*, and applied himself to the *Multiplication* by Art. If we consider his Ingenuity in using speckled *Rods* of *Hazel-Tree*, and green *Branches* of *Poplar* and *Chesnut-Tree*, we may say, that since he so well knew the Nature of the Fruitfulness or Barrenness of Sheep, as to have such a Thought, he might very well undertake an Experiment of the Grafting of *Trees* after several ways. But as nothing can be asserted as true upon this Subject, I leave off those Speculations, and proceed to perform what I before promised. I shall therefore take a Survey of all the different ways to be met with in several Authors, which will be the whole Subject of the last Chapter of this Section.

C H A P. III.

Of the several Ways, now in use, to bring up TREES and SHRUBS, as they are to be met with in some Authors.

§ 1. **W**E have already seen how God so disposed all Things in *Nature*, and with *Nature*, as that all *Plants* should be rais'd and multiplied by Means of the *Seed*. This natural Institution was followed by *Adam* and all the holy Patriarchs. Many ingenious Persons, who took a particular Delight in *Gardening*, have long since followed such a plain, easy, agreeable, and sure way, till, by degrees, they undertook to try the pleasant and industrious *Multiplication* by Art: and observing

ving that *Nature* in all respects, went hand in hand with Art, and never failed to contribute whatever was requisite to the Improvement of her Work; therefore whatever came into their Minds they endeavour'd to effect, for the Satisfaction of their innocent Desires.

However, the Curious were always of two sorts; one sort adher'd to the Natural Way, the other pitch'd upon the Artificial one: The former were satisfied they never could fail of Success, so long as they could have good *Seed* perfectly ripe, coming from good and well-tasted *Fruits*; the Creator having so disposed the Matter, as to make it natural for fruitful *Trees* to bring forth *Fruits* after their kind, which should have their proper *Seed* within themselves, which *Seed* being committed afresh to the Ground, would not only yield *Trees* of the same kind, but also of the same Bigness, and *Fruits* of the same Goodness, together with their *Seed* to sow again, and propagate the Species. Could any thing be expected of kind *Nature* more easy, and more convenient? There is nothing more to be done, but only to take the *Seed*, when ripe, and keep it till the proper Season comes, in order to cast it again into the Earth; when that small Task is perform'd, 'tis but to retire, and leave all the rest to the Care of *Nature*; and in a little while we see the great Return of so small a Trouble. But supposing that every Man can't reap the Advantage of it immediately, or perhaps not in the whole Course of his Life, yet he leaves it to his Posterity; and we ought to consider how ill we should have been pleased, if our Ancestors had consum'd all, and left us nothing. I am sure we should return them little Thanks for it; yet 'tis too true, that there are People so ill-natur'd and envious, that when they plant any thing, the *Fruit* of which they think they cannot enjoy while they live, they will spend neither Money nor Trouble about it, saying, What Business have I to work for others? Who knows who shall reap the *Fruits* on't? What do I care for Posterity? Let them plant and work themselves. I'll rather plant an ordinary

nary *Tree* that grows quick, than a slow one the *Fruit* of which I never can expect to see or enjoy as long as I live. But it is quite contrary with wise and good-natured People. 'Tis indeed reasonable we should propose an End in whatever we bestow much Care and Trouble upon, and that may very well be our own Convenience and Satisfaction; but when we are sensible that the *Nature* of this or the other *Plant* won't allow of its being so suddenly rais'd, we ought not to be disheartned, but on the contrary to bestow our Care upon it whilst we live, and leave the Benefit to Posterity, in hopes, that tho' we can't expect it from all, there may be some, however, who will shew their Gratitude to the *Planter*. The very first Author we consult will make us sensible, to our Satisfaction, that there have always been good-natured People, who applied themselves all manner of ways, both to the natural and artificial *Multiplication*, and left to Posterity a great many useful Things, tho' it be a constant Truth, that every Body does not set the same Value upon their Performances; and that on the contrary, it is the Temper of many to find fault with, and censure every thing; nor am I to expect better Treatment; but I comfort my self with the Saying of *Lewis* the third Emperor of *Germany*, *Nemo placet omnibus*, no Man can please all; much less a Man who publishes his Discoveries in any part of Learning: Yet I own, as I have often done already, that had I not been reduc'd to it by a sort of Fatality, I would never have undertaken to treat upon this Subject; chiefly because I am obliged to compose this Work in a hurry, amidst a hundred other Thoughts; and to give it thus undrest to the Printer, who is pressing for it. However, if it pleases God to grant me Health, I promise to treat the two following Parts more carefully.

In turning over several Authors, I shall examine, in the first place, that useful Work, written by Mr. *Hogberg*. In his
twelfth

twelfth Book of *a noble Country Life*, I find the Use of Woods very amply described. These are his Words.

‘ We can no more be without Wood than we can be without
 ‘ Fire; for, were we to want it, we should be little better than
 ‘ Savages, and obliged to eat raw Flesh. We may easily judge
 ‘ how disagreeable such Diet would be to us, as may be partly
 ‘ experimented from Flesh half roasted or boiled, which the care-
 ‘ less Cooks often serve up to the Table; for at the very sight of
 ‘ such half-dress’d Meats, the Stomach turns, and the whole
 ‘ Body is disorder’d: and this happens through mere Laziness,
 ‘ because they will not stoop to lay Wood on the Fire. At present,
 ‘ God be thank’d, we have Wood for our Use; but unless some
 ‘ Care be taken of its Encrease and Culture, as well for Timber
 ‘ as Firing, our Successors will have just Reason to complain of
 ‘ us; for Wood is one of the most necessary Things in House-
 ‘ keeping. ’Tis for this Reason that many able Men have bent
 ‘ their Minds to find out the best Methods for planting and cul-
 ‘ tivating Woods; but hitherto they have found no better Means
 ‘ to improve and propagate Wood, than by *Seed* and *Suckers*;
 ‘ tho’ the latter are not to be found about all *Trees*.’ Since in
 the few Books of *Gardening*, which I have by me, I do not
 find any other Method prescribed for the raising of *Trees*, than
 by *Seed*, I shall examine this Case more exactly, and enquire
 how *Woods*, *Fruit-trees*, and *Flowers* may be rais’d from it to
 the best Advantage. Mr. *Hobberg*, among other Things, di-
 rects us to a Method of planting *Woods*, which we may safely
 follow, tho’ his way is a little tedious; he tells us, we ought
 not to grudge a little Trouble and Expence for a Thing which
 will endure three hundred, and sometimes about two thousand
 Years; especially when so much Advantage will accrue from it
 to our Posterity. We are told that the *Oak* will live above
 three hundred Years; that it grows for the first hundred, and
 ‘ attains

attains its perfect Figure and Growth; in the second is at a Stand; and in the third decays. *Cardan* tells us, that *Josephus*, the Author of the *Jewish History*, had found, in his Days, in pretty good plight, the *Oak* of *Abraham* the Patriarch, so that its Age exceeded the Number of Years above-mentioned. Now although this is uncertain, yet the *Oak* is of that wonderful Use, that we ought to cultivate it with the greatest Assiduity. *Clockius* in his Treatise, *de Ærario*, Lib. 2. Cap. 2. N. 47. tells us, among other things, that the *Hessian* Wood alone, in a fruitful Year, produced *Glands* or *Mast* in such Quantities, that two hundred thousand Hogs were fed by it; and that the annual Advantage by that Means amounted to thirty thousand Florens. Besides, the Body of an *Oak* is hard, strong, heavy, thick, and lasting, and therefore highly esteemed for its Use in Building.

These are the Words, taken from a Manuscript Book of Husbandry, written by the late Mr. *Henry de Rantzau*, Governor of *Holstein* for the King of *Denmark*.

The following Method for the planting of *Oaks* is practised in the County of *Luneburg*.

Gather the *Glands* or *Acorns* when they are fair, large, and full ripe, which is about the Feast of St. *Gal*, that is, about the middle of *October*, sooner or later, as the Moon is in its Encrease. Sow them as thick as Corn, in a Field well plough'd and manur'd, covering them with a Harrow; or else you may at the first sow *Acorns* and *Corn* together; but in the Harvest the Stubble must be left so long, as that the Reapers may not injure the Tops of the young *Oaks*. But since they may be thus in danger of being trodden down by the Reapers, I therefore look upon the first of these ways to be better, and would advise to sow them in the Place where they are always to remain, and to fence them with a good Hedge, to keep out Hogs

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and Goats ; for if those destructive Cattle get in among them, all our Pains and Hopes will become vain.

We may learn from hence, in the first place the Season and Manner of treating these *Seeds*, viz. that we must gather them from the *Tree* ; whereas others chuse rather to let them fall of themselves ; but 'tis my Opinion, that the first way is better, if we take care at the same time that they are ripe ; for when they fall of themselves, they are rather too ripe, and in their Fall are apt to bruise.

In the second place, it appears from hence how this sort of *Seed* is to be increas'd. But whether it be better to sow it in Autumn, and to let it lie the whole Winter in the Earth with the *Wheat*, or to sow it in the Spring, he has not clearly expressed ; for my own part, I should not scruple to sow it in Autumn ; for as much as this *Seed* is cover'd with a Rind of a good Thickness, and therefore is not in any danger of Cold, unless the Frost is very considerable ; but the surest way is to preserve the *Seed*, during the Winter, in a dry Vault or Cellar, stirring or moving it three or four times a Week ; and if it swells to cover it all over with wet Sand, and let it remain in that Condition till it begins to shoot, and then sow it in the Fields which were plough'd the preceding Year.

Thirdly, as to his Method of sowing these *Acorns*, I cannot approve of it ; it cannot be done with Success ; for he would have us sow them as thick as *Wheat*, perhaps for this Reason, that if one misses the other may hit ; but it may well happen, that not one will grow that has been order'd in this manner. For first, they are travers'd in their Growth. Secondly, the Point of the *Seed* or *Radicle* is sometimes upwards, sometimes downwards, and sometimes on one side, which as it happens to be more or less unnaturally placed, is in proportion hinder'd in its Growth : But yet suppose they should all come up, they would then stand so
near

near together, that they would rob one another of those *Juices* which are necessary for their Vegetation ; it would be therefore much better to make Holes with a Dibble in Rows at the distance of a Span, and about three or four Inches deep ; but we must not, like some unskilful People, put two or three *Acorns* in a Hole, for there is no Reason for it, unless we are not sure that the *Seed* is good ; and in this case they ought to be proved, by flinging them into Water, by which means we may distinguish the Good from the Bad, preserving only those which sink to the Bottom ; then we must place one in a Hole ; and if they have already begun to put out Shoots, we may easily distinguish which End ought to be set downwards ; but if they have not yet begun to vegetate, we must set the pointed End downwards, and they will then grow according to the Order of Nature. There is good Reason not to sow them amongst *Wheat*, for the *Acorns* would either rob the *Wheat* of the nutritive *Juice*, or else the *Wheat* would rob the *Acorns* ; besides, the young *Plants* would be endangered at the Time of Harvest ; therefore it is much better to chuse out a Field expressly for this Purpose, being well fenced about with a Hedge ; or else we might make use of some old decayed Woods, and without much Ceremony make Holes, here and there, for the *Acorns*, about three or four Inches deep at least, at the proper Season, taking Care to fill up the Holes with Earth. Every one knows best how to protect them from Cattle or other Inconveniencies, which his Ground is most subject to.

The Undertaker of such a Work will soon perceive the Advantage of setting *Acorns*, where they are always to remain ; but if it should happen that they come up too thick, we must contrive the best Method for transplanting some of them ; and that is best done when they are about half the height of a Man ; we may then dig them up, taking care not to wound the *Roots* ; and if that should happen, we must cut off all the wounded Part. This Method of Sowing and Transplanting may be practis'd in

October or *November*; what is sown later shoots in the Spring; and what we sow in the Spring, begins to sprout between *Easter* and *Whitsuntide*. Those who would raise Plantations of *Pines*, *Firr*, *Beach*, *Elm*, *Ash*, *Alder*, *Willows*, *Cypress*, &c. should take Care to gather their *Seed* in a right Season, and also to know the Manner of sowing it. As to *Pines* and *Firrs*, some People split the *Cones* and *Pine-apples* in two or three pieces, and sow them; but 'tis a Method I don't approve of; for this way rots the *Seed*; or else being yet enclos'd in the hard *Squame*, it cannot break its way thorow as it ought. Some hang the *Pine-apples* at the End of little Sticks in the prepared Fields, imagining that the *Seed* will fall of it self into the Ground; but this Method is as uncertain as the former; for, supposing it did fall, it could not penetrate so deep into the Earth as it ought, the Sun would scorch it, it might be spoil'd by too much wet, or carried off by Birds; therefore we had better lay the *Cones* or *Pine-apples* in some dry Place till they open, and the *Seed* falls.

As to *Seeds* which are light and small, and the manner of gathering them, one might write a whole Book upon it; for it is necessary that some should be gather'd at one time, and others at another. For Example, we ought to gather the *Seed* of *Birch* and *Willows* about Hay Harvest; for if we are not very careful, it will be dissipated and blown away. At this Season likewise we must gather the *Seed* of the *Water-Willows*; for then if we open the *Husks* of them to take out the *Cotton* they contain, we may gather a great Quantity of it, as good as the common *Down*. I have fill'd several Sacks with it in the Island call'd DE OBERE WORTH, to my great Content and Satisfaction. If I would be prolix, I could set down many curious Experiments which I have made with this *Seed*; but I shall leave them for another time. The best manner of sowing this *Seed*, which is very small, is to mix it with Sand, and sow them together, by this Means the *Seeds* separate very easily, and do not fall in Clumps

Clumps one upon another. If we make a Plantation with *Suckers* and *Sets*, it will proceed very slowly; but such as love to take Pains, may take such Cuttings from their *Trees* and plant them; but I design in the last Chapter of the third Section, to shew how we may dress and prepare Woods after my own Method.

But before we examine the different Authors who treat of encreasing and managing of *Trees*, I shall observe, in few Words, how we may raise an *Orchard* of *Fruit-trees* from the *Seeds* or *Kernels*. Every one knows, that if we sow good *Seed*, it will certainly come up; and yet for all this, the Generality are so careless and regardless of improving their Grounds, that we hardly find any one who bends his Mind to so profitable an Undertaking. How easy would it be to collect the *Seeds* of good *Apples*, *Pears*, *Plumbs*, *Cherries*, *Peaches*, *Abricots*, *Nuts*, *Lemmons* and *Oranges*, and by barely laying them in the Earth to receive the Profit of a numerous Plantation abounding in Varieties of the best kinds of *Fruits*? But when we once receive a Prejudice against any thing, we are apt to grow so obstinate, that we believe nothing that is told us. Nay, tho' People are convinced of the Reason and Truth of this Method, they reject it, under pretence that they must wait too long, and at last be at an Uncertainty as to the Success of it; not considering that, tho' they should fail of good *Fruit*, they nevertheless, by this Means, would acquire a fresh and young *Tree*, on which they might graff the best kind of *Fruit*, or otherwise improve the *Tree*, so as to draw great Advantages from it. For a *Fruit-tree* can never arrive at Perfection that never was replanted, but suffer'd to remain in a neglected and desolate Condition. I have in this Work said something of the Manner of multiplying *Vines* by the *Seed* of *Grapes*; and am surpriz'd that no Author has taken the least notice of it. It is some Years since I sowed the *Stones* of *Raisins* brought from *Italy* and *Spain*, and dried artificially; and 'tis impossible to de-

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scribe the fine *Plants* they produc'd: they are now in Blossom; so that I shall soon see whether they will yield perfect and ripe *Grapes*. 'Tis well known that the larger *Grapes*, especially those of *Italy*, grow on *Vines* as high as *Trees*, and, as some say, of the Thickness of a Man's Body; they are planted at such a distance one from another, that a Cart may pass between them. Suppose now that they degenerate here to one half, or even to a third part, we shall find them still better than our common *Vines*, which grow like *Hops*, or than the wild *Bavarian Grape*. A Gentleman, who is the Owner of large *Vineyards*, has given me hopes, that he will make an Essay of this kind of *Multiplication*, the next Autumn; and I am in Expectation of his giving the World an Account of his Manner of Operation, and the Success of his Undertaking. I shall here say something for the Benefit of those who have a mind to imitate him. Take the unripe and green *Bunches* from the *Vine*, and expose 'em for some Days to the open Air, yet so as no Rain may come at 'em; after which spread 'em on a dry Floor, and take Care to turn and pick them, from time to time, to prevent their decaying, till the Skin of the *Grape* becomes dry and thin; then stone them, and sow them in a *Vineyard*, or convenient Soil that has been dug up and turned. In this manner you will have the second Year a great Number of young *Stocks*. This certainly is no small Advantage, considering the little Pains it requires; and tho' we must agree that they are only wild *Stocks*, they will nevertheless be of great Use for grafting of other fruitful *Vines* upon 'em, as I shall shew in the last part.

§ 4. I pass now from the natural way of encreasing *Plants* by *Seeds*, to the artificial one, as it is to be found in several Authors; in which I also find that there have been People in all Ages who have delighted in *Gardening*, and busied themselves in the Multiplication of *Plants*. *Theophrastus*, in his History of *Plants*, *Lib. 1. Cap. 5.* is of Opinion, that one may propagate a *Plant* by

by only sowing the *Flower*; whereof he gives this Example; That a certain Person sow'd the *Flowers* of *Thyme*, from which proceeded the finest *Thyme* in the World. He did not consider perhaps, that these *Flowers* were put into the Earth with the little Cods of *Seed*, which might perhaps be done with Success; but to pretend to propagate or encrease a *Plant* barely from a *Flower*, would be only loss of time. We must place under the same Head the *Multiplication* the Author speaks of in the same Book, *Cap. 4*, which is perform'd *per Lachrymas*, by the *Gum*, or *Rosin*; for I can allow this to be possible only in case there be good Store of the *Seed* within it, otherwise 'tis as ridiculous as the Invention of a certain Apothecary, of whom Mr. *Elsholtz* makes mention, who having prepar'd a great quantity of Salt of *Wormwood*, caus'd the Ashes to be carried, with other Dung, to his *Vineyard*; and when, the next Year, there grew a great Quantity of very fine *Wormwood*, in the Place where it was laid, he swore he never had seen any *Wormwood* there before, which might very well be; and I would not require an Oath to confirm the Matter; for if he had only examin'd the Dung, he would have found a great Quantity of little Grains of *Wormwood-Seed*, which had escap'd his Hands, and those of his Servants; 'twas from these the *Wormwood* proceeded, and not from the Ashes, in which there was nothing proper, or dispos'd to such a Propagation. But the Apothecary seems to be one of those who are for a Philosophical Generation of Things from Ashes. What Profit then must the Scavenger make of this extraordinary Dirt, which the Apothecary has been a long time gathering together; and which he takes away by Cartloads, and turns to his own Advantage!

But there are some who form better Ideas, and who look out for a Propagation and Multiplication of *Plants* by their *Leaves*. Without doubt it was the *Opuntia*, or *Leaf* of the *Indian Fig-tree*, that gave 'em the first Notion of it; for taking it from the *Tree*, and setting it in the Earth, it immediately takes *Root*, and produces

duces *Blossoms* and *Fruit*. *August. Mirandola* made Tryal of it with a *Citron Leaf*, as he tells us, *Lib. 3. Cap. 5.* ‘ I filled a
 ‘ Pot (says he) with the best Earth, sifted very fine, in which I
 ‘ set some *Leaves* of *Citrons*, *Lemmons*, and the like, with their
 ‘ *Stalks* so deep, as that the third part of the *Leaves* were cover’d
 ‘ with Earth. Above this Pot I fixed a Pitcher of Water, which
 ‘ fell, Drop by Drop, into the middle of the Pot so slowly, that
 ‘ no Drop could fall till the preceding one was almost soak’d into
 ‘ the Earth; and I continually supplied with fresh Earth the Mid-
 ‘ dle, which the Drops had wasted, by which Invention of the
 ‘ dropping of the Water, I succeeded so well in my Design, that
 ‘ I rais’d some very fine *Stocks*.’ It appears plainly, according to
 this Author, that he produc’d a little *Tree* from a *Leaf*; but they
 mistake themselves very grossly, who, by their Care and Skill,
 raise a little *Tree* from the *Bud*, which is join’d to a *Leaf*; so
 that the *Leaf* remains many Years; but the little *Bud* on the
Footstalk of the *Leaf* shoots out and takes *Root*; the Mother
Leaf seeming to look upon her Issue, till she sees her self over-
 ropt by it: For, to speak plainly, it is not properly the *Leaf*
 which becomes a *Tree*, since that is fix’d, and does not grow;
 but a *Tree* grows from it. ’Tis said that Mr. *Frederick* of *Augsb-
 bourg*, a celebrated and experienc’d *Gardener*, was the first who
 discover’d and tried this Experiment, and communicated it to o-
 thers, tho’ he has found a great many Imitators since. I had
 the Satisfaction of seeing some *Citron-Trees* rais’d in this manner
 by that famous *Gardener*, and sent by him to Count *Wratislaw*,
 Governor of *Bohemia*, my Patron and Benefactor at *Passaw*,
 who is an extreme Lover of *Gardening*, and applies himself as-
 siduously to the Multiplication of *Plants*: From him this Trea-
 tise had its Rise; for if I had not had the Honour of his Acquain-
 tance, this had never seen the Light; therefore they who reap
 any Pleasure or Profit by this Book, owe their Obligation to his
 Excellency, who has so great a Share in it, and at whose Com-
 mand

mand I wrote it. I have caused one of these *Citron Leaves*, with its little *Tree*, to be engraven on Copper, for the better Satisfaction of the Curious. At first it was thought that the *Leaf* was become a *Tree*; but upon Search, it could not be discover'd that the *Leaf* was any way alter'd, or grown either in Thickness, Heighth, or Length, but that it remain'd still of the same Form and Size; so that the *Tree* could not proceed from that, but from the little *Bud* annex'd. In the last Chapter of the third Section, we shall treat at large of the different Manners of producing *Trees* from *Leaves*, which, tho' it may not perhaps be of any great Use, will yet be something diverting.

Monsieur *Munichshausen Van Schwober* gave Light to this Experiment, having made a very surprizing and agreeable Discovery, in producing ripe *Fruit* from a *Leaf*. My Opinion is, that the *Leaf*, from which the *Stalk* (as may be seen in the Figure) proceeded, could not be a simple *Leaf*, but had a little *Bud* annex'd to it, which took *Root* and sprung up in this wonderful manner. And as I had the Honour of receiving an Extract of his Letter from Count *Maximilian de Breuner*, Privy Counsellor to the Empress *Amelia* at *Vienna*, it is but just that I should take this Opportunity of paying him my Acknowledgments publicly, and of testifying my Wishes for the Preservation of a Life so useful to the World; and having his Excellency's Authority, I shall not only insert the Extract of the Letter, Word for Word, but will likewise add a Copper-Plate of the *Plant*, to perpetuate as well as I can the Remembrance of such a Wonder.

EXTRACT of a LETTER from Monsieur de Munichshausen Van Schwober, Jan. 13, 1716, to the Baron de Brunetti.

'AFTER what has been said above, I cannot omit communicating to you what happen'd to me with a *Leaf* of a *Tree*, and what perhaps was never heard of before, but will be look'd upon (by many that hear of it) as a Fable, or at least a Paradox;

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' dox; that is, that a *Leaf*, after having produc'd a *Stem* of the
 ' Heighth of several Inches, should produce a *Flower*, and af-
 ' terwards *Fruit*, which it preserv'd. Last Year I set a *Lemmon*
 ' *Leaf* in the Earth, which, in the Summer, took *Root*, but did
 ' not shoot upward till last Spring; when taking several little
 ' *Trees* out of a Pot, in order to transplant some, and to make
 ' Presents of others, among the rest I took out this *Leaf*; but
 ' as soon as I found that it had taken good *Root*, I immediately
 ' replanted it with other *Trees*, and I think in the same Pot, but
 ' I can't be sure. I planted it so, that the *Root* only was in the
 ' Earth, and was cover'd with it, the *Leaf* resting upon it. This
 ' Summer there arose a small *Stalk*, not very high; for soon af-
 ' ter I discover'd on the Top a *Flower-Bud*, which hindred it
 ' from shooting up higher. I let this *Flower* alone, through
 ' pure Curiosity, without the least Thought of its producing
 ' *Fruit* that would come to any thing, when, contrary to my
 ' Expectation, the *Blossom* grew and opened, and the little *Fruit*
 ' within throve to the Size you may see in the annex'd Figure.
 ' At the Request of Monsieur *Volkamer*, I sent him this Autumn
 ' the little *Tree*, with its *Fruit*, after having got the Figure of it
 ' designed, desiring him to transplant it, and to take great Care
 ' of it, that so we might see whether the *Fruit* would continue to
 ' grow with the *Tree* or not.

But since most People look upon the Work of *Multiplication*
 by the *Leaves* as a very strange thing, some have turn'd their
 Thoughts another way, and have endeavour'd to effect it by the
 little top *Sprigs* of a Year old, which are easily discover'd by
 their Tenderness and Colour. To this end they have taken the
Shoots of a Year old of several *Plants*, for Example, *Willows*, *Pop-*
lars, *Mulberry-trees*, *Currant-bushes*, *Rosemary*, &c. and cut
 them below the Joint, so as that there remain'd with them some
 of the other Wood; then digging a Hole about a Foot deep
 in

in a good Soil, they have set them in Cows or Sheeps Dung, and then thrown the Earth upon it, which they press'd down very hard; and to this they have given the Name of *Multiplication* by Cuttings. Monsieur *Laurenberg* must have lov'd and exercised this way very much, since he assures us, that one may encrease almost all manner of *Plants* by Cuttings, which I agree to, and shall treat of in the last Chapter.

I wonder that, in regard to *Gardening*, this profitable way has not been more earnestly follow'd, and a Tryal made with other *Trees*, and with *Branches* of two, three, four Years old, or more; but it seems as if Things were often left so on purpose, to give room for others to think and write upon the Subject. 'Tis sufficient that this Invention has given us Light so far; and we ought to acknowledge the Obligation.

Since this Matter has been known in the World, there have been many Experiments made upon the Subject. But when some People found their *Cuttings* or *Slips* begin to decay, they attempted a new Discovery, in order to preserve them from that Inconvenience, which was as follows. In the Beginning of the Spring they lopp'd off a large *Branch* of *Willow*, and piercing it full of Holes at six Inches distance; they fitted to the Holes several *Slips* or *Cuttings* of *Fruit-trees*, and fix'd them in such a manner, as to penetrate quite through the Wood of the *Willow-Branch*, having before with a Knife taken off the outward *Bark* of the *Slips* at the large End, about as far as 'twas necessary for them to pass thorow. After which they buried the *Willow-Branch* with the *Slips* in good Earth; from which, the Spring following, they took them, the *Slips* having taken *Root* at Bottom; then they cut the *Willow-Branch* to pieces between the *Twigs*, which had been inserted in it; every one of which that had taken *Root*, was again planted separately in the Earth. This Operation is called *Piercing*. When I made Tryal of this some Years ago, I found one great Difficulty in *Piercing*, which was,

that I must have a different Augur for every Graff, since they ought to fit the Holes so exactly. Now to remedy this, I slit the *Willow-Branch* length-wise, or else I cut two others, so that they fitted exactly one to the other, and making Notches in them, fix'd the Graffs between them; then I bound them together, and closing the Overtures both above and below with prepar'd Wax, I put them in the Ground; but I found the thing did not succeed, for which a great many Reasons may be given. Sometimes the Wood, in which the *Cions* were fix'd, would rot, which infected them; sometimes also we might perceive upon and between the *Willows* great Numbers of little white Worms, which came from the Putrefaction of the Wood. At other times I perceived that the *Cuttings* drew in too much Moisture, which over-heated their *Pith* and destroyed them; therefore I cover'd the Ends of the Graffs below with prepar'd Wax, which prevented this Inconvenience, and there gather'd a Matter like a *Callus*, from which the *Root* proceeded. By this means, tho' the Invention is of no great Consequence, I made some Discoveries, which have been of great Use to me in my Work; so that however inconsiderable an Invention may be, and though oftentimes it does not succeed, it yet has its Use in giving us a Light to better Thoughts.

And who knows whether Mr. *Lignon*, Royal Botanist at the Court of *France*, famous for his Voyage to *Guadalupe*, was not inspir'd by this Adjustment of the Graffs, to make his Discovery of the Glass-Bottle full of Water; for he took from some of the rarest *Plants* the slenderest *Sprigs*, about the bigness of a Goose-quill, which he broke towards the Points, and set in a Bottle full of Water, exposing them to the South Sun, and renewing the Water three or four times every Week; and at the End of six Weeks there appear'd at the *Extremities* of the *Sprigs*, which were in the Water, little white Points, about two Lines in length, and of the thickness of a Pin, which were so many little
Roots,

Roots, as is amply describ'd by the Abbot *de Vallemont*, in his *Curiosities of Nature*, p. 230. Of what Use this Operation may be, 'twill best appear to those who shall make the Tryal.

But these ways not succeeding always, some People made an Incision in a *Tree*, especially in the Spring, before the *Buds* were open'd, singling out for that purpose a *Branch* that had shot vigorously, in which they made a Slit, or else a Notch; then they took a little Pot made for the purpose, which was open at the side, thro' which they put the *Branch*, so that its little End came out above; they filled the Pot with good Earth, and stopp'd up the Hole in the side, that the Earth might not fall out; after which they tied the Pot to a large *Branch* of the *Tree*, or to a separate Stake, or to the *Branch* it self, so as that the Agitation of the Wind might not hurt it.

A Year or two after they sawed off the *Branch* under the Pot, from whence they took the new *Tree* and planted it. And this is indeed one of the most curious and most certain Operations, and is often practis'd by *Gardeners*, tho' seldom on *Fruit-trees*; whether it be thro' Negligence, or want of Patience, to wait so long before the *Branches* take *Root*; or whether it be because it requires Pots too large to be hung on *Fruit-trees*, is what they know best.

From these Inventions People proceeded to others; and as they perceiv'd, that in making such Incisions, there was a certain Matter found, which represented the first Substance, from which the *Roots* afterwards proceeded; they observ'd at the same time that they could shoot no further, without good Earth to promote their Growth: they therefore rather chose the following Method. They took a *Branch* yet on the *Tree*, and after an Incision made in it, they bow'd it to the Ground, and laid it therein, to the end it might receive a better Nourishment, as well for those Parts which were in the Earth, as for those which were expos'd to the Air. We call this *Increasing by Layers*. It has chiefly

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ly been tried on *Rose-Trees* and *Vines* in the following manner. They chose for this purpose a flexible *Branch*, which was pretty near the Ground; then they dug a Hole of a reasonable Depth, and gently bent the *Branch* down, so that one *Bud* at least might be cover'd with Earth, and the Top-end of the *Branch* might appear above Ground. In this manner the *Branch* took *Root* by degrees in the Earth. Six Months, or a Year after, they cut the *Branch* from the *Rose-Tree* or *Vine*, and replanted it in some other convenient Place. This useful manner of Propagation is known almost every where, and is very much follow'd, especially in *Vineyards*, where it is of very great Advantage.

But other Lovers of *Gardening* have not stopp'd here, but have tried it upon great *Trees*. We find, among the *Curiosities* of the aforementioned Author, that Monsieur *Leewenboek* made this Operation on a *Lime-tree*, which he buried in the Earth with its *Head*, and all its *Branches*, which grew there. To keep it in its place, he drove down Hooks, or Stakes of Wood into the Earth, so that the *Trunk* came out of the Earth a Hand's breadth, and the *Root* was uncover'd. The following Year finding that the *Branches* had taken *Root*, he cut them all off to two Fingers length in the Earth, and chose a convenient Place to plant them in. This Manner is one of the best ways of *Multiplication* by artificial Incisions; but the Owner of a *Garden* can seldom spare room enough for this Operation; or if he has room enough, and will put it in practice, he spoils his *Garden* by the deep Trench which he is obliged to dig, as may be seen in the Figure annex'd. But this Experiment, which I have often practis'd, has inspir'd me with some singular Thoughts, which I will communicate at a proper time.

Among the many Thoughts and Reflections on the Ways of multiplying *Trees*, some curious Persons have taken notice, that at the Bottom of the *Trunks* of *Trees*, there sprout out some little *Shoots* or *Suckers* from the *Root*; these

these they took from the Mother, leaving nevertheless something of the old *Root*; and in Spring or Autumn they transplanted them, having par'd them a little, and thereby acquir'd very pretty *Plants*, which soon attain'd their perfect Growth: this way is the most certain. And if one could find that naturally all *Trees* have these *Shoots*, there would be no need of applying to any other manner of Propagation.

Lastly, Some have begun to encrease *Trees* by the *Root*, as being perswaded, that every thing which already has a *Root*, grows more easily; they therefore took this Method of multiplying as well the *Bulbose* as other *Plants*, especially such as have large and thick *Roots*; these they either left whole, or cut to pieces, as particularly *Roses*, *Currants*, the *Helicampae*, the *Iris*, &c. but there they rested, without making Tryal of foreign *Trees*, wild *Trees*, or others. I shall give an Account in the following Section of what I have done in this way, and what I have experienc'd and found good. My Enemies are now mighty glad of this Occasion of falling on me; for they have given me openly to understand that they design to criticise this Work: But let 'em begin when they please, they'll find an Answer. I have here the best Opportunity in the World of naming a certain malicious *Detractor*, who is pretty well known, and of using him as he deserves; 'tis he that has dispersed here and every where his silly, scandalous, and defamatory Libel; whereas he never received any thing from me but Favour and Kindness, I having kept him several Days in my House *gratis*, and treated him in a manner no way deserving such a Return; though indeed I never had any great Respect for him, but only on account of his being very much recommended to me by some Persons of Distinction, whom I don't thank for it. His malicious Behaviour will give me Reason never to trust so easily to Strangers. But I will not return Evil for Evil. I serve God and my Neighbour to the best of my Power: *Ultra posse nemo obligatur*

obligatur; and more ought not to be requir'd of any Man. If another knows any thing better, let him publish it, and the World will be oblig'd to him: for my part, I shall be very glad. It is a long time since his Mountains have been in Labour; sure they will be deliver'd at last of something that will surprise and make the whole World merry. I will not employ any Venom or Revenge on this Subject, as a certain *Gardener* has done, who, tho' my Affairs no way concern'd him, was afraid he should burst like a Toad, if he did not vent his impertinent Malice, telling me in his Letter, that it always mov'd his Choler when he read the Word *Universal Multiplication* in my Title Page; to which he had this Answer, *Fool, do you think I care if your Malice renders you mad, or paralytic? 'Tis no Concern of mine; and I esteem all your Threats and Rage as little as the Sting of a Fly: For impotent Malice is a very vain thing. Away then to your Dung-hill, and leave me at rest. For my part, I shall never trouble my Head about you, but shall learn to despise the Venom of an evil Tongue; with the Help of God, I'll perfect the Work I've begun, and impart to the Publick my different Methods of Universal Multiplication.*

Explanation of the Fifth Plate,

Which represents a strange Experiment made with a Lemmon-Leaf.

(a. a. a.) *Monsieur Munichshausen de Schwober's Lemmon-Leaf, which took Root.*

(b. b.) *The Stalk which sprung out of the little Bud, and rose with a perfect Flower, which form'd the Fruit.*

(c.) *The perfect Fruit it self, which was produc'd by means of the Leaf, and arriv'd to the Bigness as in the Plate.*

(d.) *A*



(d.) *A little Lemmon-tree, which sprung very high from a small Bud; and how the Leaf, which was the Mother, remain'd several Years, and assisted the little Plant in its Growth.*

(e.) *Represents a Lemmon-leaf without Eye or Bud; and shews how it is planted artificially in the Earth, upon which it takes Root.*

(f.) *The same Leaf; how there is form'd at the Bottom a kind of Callus, which produces a Root; and how, by little and little, the Substance of the Leaf perishes, so that there remains only the Stalk in the Middle with its Ramifications.*

(g.) *How in the Spring the Foot-stalk of the Leaf shoots afresh here and there with little Buds.*

PLATE VI.

Divers Operations perform'd by several curious Men.

(A.) *Thyme, which is said to have been produced only from the sown Flower, explain'd in the fourth Section.*

(a.) *Gum, or Rosin, wherewith a certain Person thought he had raised several Plants. See Section IV.*

(b.) *How a great quantity of Wormwood proceeded, as 'tis said, from the Ashes of Wormwood. See Section IV.*

(c.) *A Leaf of the Indian Fig-tree; and how it became a Tree, which gave the first Rise to the Multiplication by Leaves. See Section IV.*

(d.) *In what manner Trees are encreased by Piercing. See Section V.*

(e.) *Manner of increasing Plants, by Cuttings planted in a fertile Ground. See Section V.*

(f.) *Multiplication by the Bottle of Water. See Section V.*

(g.) *Multiplication by Incision or Cutting, which is done by means of little earthen Pots, or Tin-boxes. See Section VI.*

(h.) *A curious Multiplication made by a great Tree being put in the Earth.*

(i.) *Increasing of Trees by Layers.*

(k.) *A particular Branch or Stem of the Tree, which is set in the Earth, shewing how it takes Root at Bottom, and may be afterwards transplanted.*

(l.) *Stakes or Forks for pinning down the Branches, to prevent their rising.*

(A.) *How little Stocks rise from the Root.*

(m.) *How a Propagation may be made by the little Shoots.*
See Section VII.

(n.) *How a Multiplication may be also made by cutting the Root.*

PART I. SECT. III.

CHAP. I.

THOUGH upon mature Reflection we could have no reason to censure any one, who should say, that for some Ages the liberal Arts and useful Sciences have been at the highest pitch of Perfection, insomuch, that it seems as if Art had a mind to equal Nature, and even out-do her in many things; notwithstanding this, I say, such as are truly Lovers of Enquiries into natural Things, do not rest here, but apply themselves to a further Search into Ways and Means of promoting and perfecting such Things as have been begun, but left unfinish'd by Nature, in which they spare no Labour, Care or Art. Thus the Saying of old Philosophers subsists still, *Ubi desinit Natura*
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ibi incipit Ars; where *Nature* leaves off, there *Art* begins; and what *Nature* has begun is finish'd by *Art*. Now we must not give our selves up rashly to the Knowledge of all the Arts and Sciences that are in the World, since there are some Sciences which do not at all become a good Christian, and for which he ought to have an Abhorrence. For we must know there are diabolical *Arts*, such as were in use in *Pharaoh's* Court, by which the Magicians turned their Rods into Serpents, in Imitation of *Moses*. And with what Ease did the Witch of *Endor* shew the Prophet *Samuel* to King *Saul*? Not to speak of the famous Dr. *Faustus*, who, at any time, being desir'd, made *Trees* grow up suddenly, with the finest *Fruit* in the World. But no Body had the Liberty of touching them, or gathering the *Fruit*; for if any attempted it privately, they were sure to pay dearly for their Folly; and many more Tricks are related of him. Among these impious *Arts*, we ought to place that of foretelling what is to come, which these diabolical *Artists* learn of their Master, &c. Of this sort of Artists too are such as pretend by Glasses, by the Fire, or Smoke, to predict good or bad Fortune, Life or Death. Above all, we must put in this Rank all those who pretend to discover hidden Treasures, to raise Spirits or Devils; and those who boast of being able to render themselves or others sometimes visible, and sometimes invisible; and yet would make us believe that they work in a natural way, pretending that there is a *Stone* found in *Scotland* which renders such as wear it invisible and insensible; and that they who know how to prepare the Head of a black Cat, may perform the same Operation. The Things they use are indeed natural; but *Belzebub*, in time, will reward these Labourers in Iniquity.

§ 2. As to natural Magic, which often produces astonishing Things; the Simple, through Ignorance, take it for something supernatural; but when we come to a nearer View, we perceive 'tis founded on a natural Basis, and may be demonstrated

by Physical or Natural Principles. For what strange Effects are there produc'd by *Sympathy* and *Antipathy*? And what fine Discoveries made by the *Mathematicks* and *Astronomy*? What Secrets are discover'd by *Physiognomy*? What Wonders does a knowing *Physician* foretel by his Art? What surprising and almost incomprehensible Things are perform'd by *Chymistry* and experimental *Philosophy*, by which we may produce something like *Thunder*, *Lightning*, *Snow*, *Ice*, *Wind*, and the like *Meteors*! Examine *Alchymy* a little, what astonishing *Phænomena* does it not include? And when one looks into the Books that treat of it, how is one surpris'd at the Figures and philosophical Representations which are there set forth. If we proceed to a further Examination of such Magick *Arts* which are lawful, what terrible Representations and frightful Appearances of Things do we behold? How are we surpris'd by (a) *Anamorphic Magic*? What strange Sights are represented by (b) *Parastatics*? And who would not be in an Ecstasy to learn how to speak or write to their absent Friends by Looking-glasses, as is taught by (c) *Catoptrologie*? As also how to cure Diseases by different Tones of the Voice, as we learn by *Phonostatics*. It would be too tedious to speak of the Wonders which are perform'd by (d) *Hydrotechny*, *Ærotechny*, *Pyrotechny*, and other Magical and Natural *Arts*, by the Means of *Water*, *Air* and *Fire*.

There are other *Arts* which are indeed very estimable, of which the World has some Information; but the Discovery is not yet perfected, nor will it easily, tho' abundance of curious Persons continually apply themselves, and spend all their Time and Mony in the Search. Such especially is that of the *Philosophers*

(a) *Anamorphatics, i. e. The Art of forming different Figures.*

(b) *Parastatics, i. e. The Art which makes Representations of Things.*

(c) *The Author would have done well to let us know why this kind of Magick is more natural and more allowable than the others.*

(d) *These are Sciences which teach to do surprising Things by the means of Water, Fire and Air, by Water-works, Fire-works, &c.*

Stone, or the *Universal Tincture*, the most precious Gift of God. How many are there at this Day retir'd into secret Corners, and puzzling their Brains about these Philosophical Chimeræ's! (e) I will not absolutely deny but there may be such a *Stone* in Nature; but who is there can boast of being in a way to obtain it? 'Tis that is the Difficulty. In the mean time, People of all Conditions attempt this Discovery; but the Event generally shews the Folly of the Undertaking. The greatest Part of these Artificers have been reduced to Beggary. And I have often wondred how it was possible for those People to abuse the Goodness of Gentlemen in such a manner; and that the latter can suffer themselves to be impos'd upon by such Persons; for if they were so thoroughly Masters of the Art they pretend to possess, what need would they have of the Favour of others? But instead of the *Adepts*, they ought to be call'd the *Inepts*. I know one of these scoundrel Philosophers, who has the Art of Wheedling in such Perfection, that he is capable of perswading People, tho' they had buried their Mony a thousand fathom deep in the Earth, to take it out to furnish him with it. Among other things, he cut off the Feet of a living Pullet, which he calcin'd; and then mixing some Leaf-Gold with it, gave out that he had discover'd the Art which *Moses* had, of converting Gold to Ashes. An admirable Master-piece of so great a Philosopher! Another Trick he had was yet more pleasant, he reduc'd Lead to Ashes, with which

(e) So many able Men have demonstrated that the Transmutation of Metals is not altogether impossible, that we must allow them to have some Reason; but the vast Numbers of People that have been ruined by it, ought to frighten every Man that has his Senses. The greatest part of the Adepts are Rogues by Profession, whom Lemmeri, in his excellent Course of Chymistry, describes so naturally, that None who have read him can be surpris'd by them. If we allow the Philosophers Stone to be possible, it is as much as we can do. Neither can we reasonably believe, that a Matter proper for the Transmutation of Metals (if there was such a thing) should be capable of curing all Diseases, of restoring Youth; and, in short, of doing all the Miracles which are attributed to it. The safest Course is to hold this excellent Definition of Alchymy, that it is an Art, whose Beginning is Lying; whose middle State is Labouring; and whose End is Begging. Principium mentiri, Medium laborare, Finis mendicare.

he pretended to ripen Pearls in a Minute's time; yet hardly had he touch'd any white Pearls with this Tincture but they became black; and, after he had spoil'd some in this manner, he would have come off, with saying, They were the Growth of *Muscovy*, We saw in the Person of *Cajetani* at *Berlin*, what is the ordinary End of these Gold-makers; for they gave him the *Greek Pi*, (a) as a Reward for his Labours. We may number the *Alkabaest* among these mysterious Arts. I must own, that some Years ago, I applied my self earnestly to the Discovery of it; but seeing the Impossibility of succeeding, I quitted that laborious Study. Nevertheless, I found by that Means an universal Dissolvent for Metals, which dissolv'd at the same time in a Vial all Metals and Minerals, as well as all precious and counterfeit Stones, and most of the solid Parts of Animals and Vegetables, without any way losing its Transparency; for, throw in what Matter you will, you'll never see any Precipitation. After the Dissolution it stains the Metals, and counterfeits a Stone; such as a *Gold*, *Silver*, *Iron*, *Copper*, *Quick-silver*, or a *Diamond Stone*, having no Acrimony, but only a little Bitterness; afterwards I can convert it to Oil or Water. I can, if I please, force the Gold or Silver Stone over the *Alembick*, without losing any thing. I have made a great many curious Experiments with it; and if my Purse will allow me in some new Enquiries, I shall labour very diligently in them, tho' I apply my self more to *Medicine* than to the *Science of Metals*; of which I shall treat more largely in another place. Among these Arts we may justly place the following, viz. That of rendring Glass ductile and malleable, so as to be forged into any Form; as also that of finding the Hyperbolical Line in a Burning-Glass, and a perpetual Light; the Longitude; the Quadrature of the Circle, and (b) a perpetual Motion; in all which

(a) The Greek Pi is made thus Π , which resembles a Gallows, as indeed the Rogue whom he mentions was hang'd.

(b) See Remarks

so many Persons have labour'd, and carried Matters so great a Length. Among others, the perpetual Motion of Father *Saltfckius*, that of *Andrew Neuszner*, and of *Hartman*, are well known. I could, above all, wish to be so happy, as to see the perpetual Motion, which the learned Mathematician Monsieur *Orffyreus* has discover'd. I could be glad to gain as much Credit by my *Universal Multiplication*, as he has done by his noble and wonderful Discovery. But let People be pleased to say of me for this time, *Si desint Vires tamen est laudanda Voluntas*; tho' my Power fails me, yet my good Will deserves some Praise.

§ 4. We have only now some pernicious and foolish Arts to take notice of, such as that infernal Invention of Gun-powder? How many Cities and Fortresses has it ruined? How many thousands of Men has it destroy'd? And what is most deplorable is, that this Art grows more and more compleat every Day, and is brought to that Perfection, that in *Holland* and some other Parts they have Fire-Pumps fill'd with burning Compositions, wherewith they eject fiery Torrents to a great Distance, which may occasion dreadful and irreparable Damages to Mankind. We may rank with this mischievous Company, such as swallow Fire, Nails, Iron, &c. tho' they do themselves more hurt than others. What can be more ridiculous than the Art of Flying, Sailing or Swimming in the Air? Yet we find there have been some who have practis'd it, particularly one *Hautsch* of *Nuremberg*, who is much spoken of for his *Flying Engine*. In the mean time 'tis well for the World that these Attempts have not succeeded; for how should we seize Malefactors; they would fly over the Walls of Towns like *Apelles Vocales*, who, they tell us, sav'd himself by leaping over the Walls of *Nuremberg*, and the Print of whose Feet is there shewn to Strangers to this Day, believe it who will. Several Authors tell us of a certain Shoemaker at *Augsbourg*, who could take a Turn in the Air where-ever he pleas'd with his Last.

And

And there are some who assure us, there was a Man at the *Hague* who had the Vanity to attempt to fly, by means of his artificial Wings. Others have invented Boats or Machines of Straw or Cork (*a*), and equip'd them with Sails, Oars, &c. in order to navigate in the Air. In the Company of these nimble and volatile People, we may place Rope-dancers. And we may see in the Person of the famous *Arthaban*, what End their wretched Art brings them to, who having here (at *Ratisbonne*) fastned a Rope to the Steeple of the Golden-Cross, pretended to fly down on it in Fire and Smoak; but had hardly begun his Descent, when he fell and broke his Neck.

As to useful Arts, we have reason to thank God for the great Number which have been discover'd. Let us only consider a little the Ingenuity of Handicrafts, in which, tho' the Workmen are often unacquainted with the Grounds or Reasons, yet the Work is perform'd according to Art. But if we were to deduce and demonstrate Arts by their fundamental Principles, how far (for Example) would that of a *Watchmaker* lead us into the Secrets of *Astronomy*? If we reflect on the Art of *Printing*, what Attention, what profound Meditation does it not require? If we consider the Art of *Engraving* upon Copper-Plates, what Advantages have been drawn from it? But leaving all other Arts, as well the necessary as the useful, I shall confine my self only to the Consideration of the Art of *Gardening* and *Agriculture*, which is so antient, so profitable, and so curious.

This Art, in a little time, became very much beautified, enlarged, and improv'd by Persons of all Ranks; and we see, at present, that the Lovers of *Gardening* do, for their Diversion, spare no Cost nor Care in adorning and improving their *Gardens*

(a) A certain German Jesuit has publish'd an Essay on this Art, wherein he pretends to demonstrate the Possibility of making a Machine to fly in the Air; and offers to build such a one, if any Prince will furnish the Expence.

into a Resemblance of the Earthly Paradise. Being likewise desirous to contribute something to this Diversion, I formed a Project for the *universal Multiplication* of all *Trees, Shrubs* and *Flowers*, which I founded on natural and solid Reasons: But I will not affirm, that all will answer at all times in Practice; for Circumstances often hinder a thing from succeeding, tho' its Execution may in it self be possible. And though there should be an hundred disappointed in their first Essays, yet they ought not to attribute their ill Success to a Defect in the Art it self, but to some other Obstacles which were unforeseen. For those curious Persons who receiv'd my first Overture of an *universal Multiplication*, did not always succeed as they desired in their Experiments, though they had prepar'd every thing according to the Method I propos'd: but others have had better Luck. And I must own I have learn'd very much from what has been communicated to me by some Gentlemen, to whom I left the Tryal of many things: 'Twas with Design that I propos'd the most difficult manner to them; for I knew it to be founded on Nature and good Sense; and that it would be the best that ever was invented, if Nature did it Justice. Now as my Profession obliged me to be oftener at the Bed-sides of the Sick, than in the *Garden*, I had not Opportunity to examine and make Tryal of every thing my self, my Method being made publick without my Knowledge. Nevertheless, I hope Nature will favour this Art, as it is now improv'd, in the approaching Autumn, at least, which is the best Season for it, especially in case things be manag'd according to my several Experiments and Directions. On the other hand, there is no occasion to make these Experiments in such a manner as to suffer Damage by a Disappointment; for they may be made by degrees, with little Expence, till such time as we are assur'd of a happy Success.

To conclude, I shall here explain my self, touching this Term *Universal*. I am not of Opinion, that the same manner
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should be made use of for all *Trees*, or that it will equally benefit all *Plants*; but herein I do as skilful Physicians use to do in examining a Disease, in order to give it the true Name; to which end they first collect all the Signs or Symptoms, which when they have put together, they form out of them a *Pathognomonic Sign*. In like manner I comprehend and understand, by this Term, all the different Manners of Operation which are to be found collectively in this Work, in which Sense I believe the Phrase *Universal Multiplication* may pass, and be receiv'd every where; for if we look into the several Parts of this Work, we shall find some things that never were thought of before. But before I proceed on this Subject, I must say something of the Occasion of my engaging in it (of which I have already made some mention in my *Succinct Account*) that so it may be known how these Thoughts came into my Head, and how I could persuade my self, that there is an *Universal Multiplication* grounded in Nature.

C H A P. II.

Of the Original of Universal Multiplication, and what occasion'd the first Thoughts of it.

§ 1. **I**N this Chapter I must publish what I have hitherto kept as a Secret. Tho' I am naturally a Lover of *Gardening*, yet I would never discover it, by reason of the continual Occupations of my Profession. Nor did I dare to practise that Art so much as I would have done, for fear it should be said I neglected my Patients to employ my self in my *Garden*; therefore I did my Work in secret, and at my Leisure; and when I

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was tir'd with running about the Town, I sometimes sought a Retreat in my *Garden*, where I found my Repose in making Experiments: But I often changed my Taste. My first Passion was for *bulbose Roots* and *Flowers*, of which I bought a great quantity in *Holland*; but having satisfied my Curiosity, and finding they were too apt to degenerate, I gave them over. Then I sent for all manner of *foreign* and *rare Seeds* from *Paris*: They were indeed Rarities; but after they had served me as an Amusement for some Years, I laid them aside too. My next Fancy was for *Carnations*; and I neglected nothing to have them of all sorts, as well *Picotées* as *Bezarts*; and this Humour continu'd with me for some Years: But at length I grew weary of them too, considering they gave only a slight Pleasure to the Eye and the Smell; and sought for some more solid Delight, such as the propagating of choice *Fruits*. Thus I chang'd my Inclination, and my *Flower-Garden* immediately became an *Orchard*. But I found so much Ignorance, and even Roguery, in some *Gardeners* I employ'd, that in order to have young *Plants* of the best *Fruits* I was obliged to apply my self to the Work.

I begun then to graff my *Trees* my self, and to multiply 'em the common way. I thought, with other People, that this was the true Art of rendring Nature obedient, and of forcing her to give us what we require of her. I examined a little further into this mysterious Art, which changes the natural Qualities of *Trees* and *Fruits*; and this Enquiry brought me into a Search agreeable enough with my Humour; which was, who had been the first Man that could think of trying whether a Graff, being set on another *Tree*, would still retain the Qualities of that from which it was taken. This Curiosity, tho' of no great Use, was in some manner answer'd by what I read in *Theophrastus's History of Plants*, wherein he relates, that a Bird having let fall a Grain of *Seed* (which it could not digest) into the Cleft of a *Branch*, the Substance mix'd and incorporat-

ted so with that of the *Tree*, that it grew, and gave the first Occasion to Graffing. But if we'll believe *Pliny*, that Natural Historian, it was thus: A certain Peasant making a Hedge round his Cottage; the better to preserve the Stakes which he employed in this Inclosure, he set *Ivy* about 'em; the Stakes, which probably were of green Wood fresh cut, incorporated so with the *Ivy*, that they acquir'd new Life from it, and grew like *Trees* planted with their *Roots*. To these I shall add another Story (tho' probably no better than a Fiction) which I have heard upon the same Subject.

It is a Custom establish'd among many People, for Lovers to plant a green *Tree* before their Mistresses Doors, on the first of *May*. A certain old Man had a mind to perform this Piece of Gallantry in Honour of his House-keeper; but as his Strength would not allow him to go to the Forest to cut down a *Tree*, he contented himself with taking a *Branch*, which he fix'd in the Cleft of an old *Tree* that stood before his Mistress's Window, so as the *Branch* seem'd to grow out of it. The Month of *May* being pass'd, every one took away their *May-poles*, which were dead, and had lost the Beauty of their Verdure; but that of the old Gentleman, on the contrary, was grown fresher, and was so united with the *Tree*, that it drew from thence both Nourishment and Growth. Nothing was talked of in the Neighbourhood but this wonderful *May-pole*, tho' the Story could hardly gain Belief, till People were convinc'd by their Eyes that it was true; and their Reason afterward informing them, that there was nothing in it but what was natural, they begun to imitate it, and to perfect an Art which *Chance* had found out. The Reader must do me the Justice to believe I give him this Relation only for his Diversion; for the Art of Graffing is very ancient. I know very well, that there is a Difference made between Inoculating and Graffing; but I believe that in this Work it will be no hurt to make use of them as Synonymous Terms.

§ 2. The

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§ 2. The Art of Graffing in the Cleft consists in taking a sound *Graff*, and placing it in the Cut of a *Branch*, or Stock of a young *Tree*. This manner is very common, and is generally known; yet there are many *Gardeners* who, out of twenty *Graffs*, have eighteen fail. They will say perhaps they have an unlucky Hand; but I say rather they have an unskilful Hand, which I have experienc'd to my Cost. But I have at last found one that never fails. He cuts off the Head of the wild *Stock* very short, that is, very near the Earth, and takes, for that purpose, a *Cion* that has shot out well that Year, and after having carefully smooth'd the Surface of the *Trunk*, then, with a Knife (used for pruning in *Gardens*) he makes a Gash from North to South, and then cuts the *Graff* just in the Joint, whether it be a *Branch* of two or three Years old, or a long *Shoot* of the same Year, and makes the Entail on each side near the Bud. It is best to cut the *Graff* on both sides, as we cut a Pen, a little slanting, taking great Care not to do the least hurt to the *Pith*; and observing not to make the Cut too far in; for the deeper the Wound in the *Tree* is, the more difficult it is to cure. It is strange that some People make great Wounds in *Trees*; whereas the Effect always shews them to be in the wrong. We must likewise take Care in fixing the *Graff* in the wild *Stock*, that the *Bark* of the one answers exactly to the *Bark* of the other, for so the *Sap* rises the better into the *Graff*: All this being done, we must cover the whole with Graffing-Wax, which is generally known; but its Composition is different. My *Gardener* took half a Pound of common Pitch, a quarter of a Pound of Wax, and half an Ounce of Oil of Almonds, these he melted together over a Fire, and when the Composition was well mix'd, he made long Rolls of it to keep for Use; but if it was made in Spring or Autumn, he put a moderate Quantity of Turpentine to it: After having cover'd the Cleft with it, he put a doubled Paper or Linnen over the Top of the *Tree*, tying it with *Bass*, or with small
split

split *Osfers*, but not too hard, especially on Stone *Fruit-trees*; now to hinder the too great Pressure, he put on each side of the Cleft a narrow Slip of the *Bark*. Country *Gardeners* and *Peasants* only use Clay instead of Graffing-Wax, over which they put a bit of Linnen; and that it may not crack with the Heat of the Sun, but may be always moist, they tie *Moss* over it with *Bafs*.

§ 3. When I had seen the ordinary manner of Graffing, and had put it in Practice, I tried also to graff two or three times one upon another, which is a very good Method, and is called reiterated *Graffing*, or the double or triple *Incision*. This Operation is thus perform'd: They first graff a good *Cion* on a wild *Stock*; this they cut away to the half or a third part, and fix another *Graff* on it of a better kind, and on that another; for the oftener a *Tree* is engrafted, the finer *Fruit* it produces; in this manner I have cultivated *Muscat-Pears* of an exquisite Taste. I took from my *Orchard* a *Stock* graffed with the *Pound-Pear*, on which I grafted a good Summer *Bon Chrétien*; when this *Branch* had shot, I grafted a *Cion* of the *Bergamot* on it, which I also cut and graffed upon it a *Cion* of the *Muscat-Pear*, which has given me great Satisfaction. I used also to graff in the *Splint* or *Intail*, which is properest for large, wild, and unfruitful *Trees*, that have a *Stock* of a Foot or two diameter; this is done in the manner following: Cut off the Head of the *Tree*, leaving the *Trunk* only half a Man's Height from the *Root*, then smooth the Top with a Knife; after which divide the *Stock* into six, seven, or as many more Parts as you design *Graffs*, which, when you have mark'd out, take a good Knife, and with a Mallet strike it on the mark'd place thro' the *Bark* into the Wood; then withdraw your Knife, and make an Incision against it on the other side, so as to resemble an Angle; then take a *Graff* an Inch thick, and cut it also at the Bottom on both sides Angle-wise; then fix it in the great *Stock*, so as the *Wood* may fit with the *Wood*,
and

and the *Bark* with the *Bark*. You may make an Intail over it, so as to hold them together, as the Figure demonstrates. When this is done, you must take Care to cement the Top, and tie it as it ought with *Bass*. This is a diverting, tho' troublesome Operation; and when all the *Graffs* take, they pay us very well for our Pains, as appears by the Plate.

§ 4. Besides this, we find another manner of Graffing, which is called Engrafting of *Branches*. This is a very certain and profitable Operation, and is best practis'd on large, well-grown *Trees*, and even upon the old, with great Satisfaction. You must not, in this case, divest the *Tree* of all its *Branches* at once, but only lop off the half, which is enough at first; for if we take away all, we find that the Volatile *Sap*, which circulates vigorously toward the Top, will choak the *Tree* by its Super-abundance. Now when the *Branches* are well prepar'd for the Purpose, we make use of *Graffs* of three or four Years old, and take Care to support 'em with Stakes, to prevent any Inconveniency from the Wind or otherwise: You will have perhaps the same Year, or it may be the second or third, such a quantity of *Fruit*, as the youngest and soundest *Trees* would hardly produce.

When I had sufficiently examined this Manner, a Curiosity seized me of trying another Method. In the Month of *February* I took up several wild *Stocks* which were fresh and sound, and after lopping off their Heads, I engrafted them in the ordinary manner; then I put them in the Cellar in Pots of *Sand*, and took a requisite Care of them; they begun then to revive and grow, and to shoot out little by little. In *April* I brought them gradually into the Air, and then they begun to bloom a-pace, and in *May* they were in full *Flower*. This is an agreeable Pastime, but of no great Use in the Practice, yet it has alter'd my Ideas.

Being desirous to proceed still further, I look'd into several Treatises of *Gardening*; and among other Methods for the Improve-

provement of *Trees*, I found one which is call'd *Grafting in the Bark*. In this Operation you do not cut the *Stock*, as in the ordinary manner; but only thrust the *Graff* between the Wood and the *Bark*. This may be made use of for *Stone-Fruit-trees*, but is most proper for *Kernel-Fruits*. I take a sound *Graff* of one, two or three Years old; and at the Bottom, near a *Bud*, I make an Incision with a *Grafting-Knife*, but not so deep as to hurt the *Pith*; then I cut the rest of the Wood, pointing towards the Bottom, a Knot's length, but only on one side; then I peel off the outer brown or grey *Bark* on the other side, in such a manner, as not to hurt the inner green *Rind*. Whether the Overture between the Wood and the *Bark* should be made on the North or East-side, is what I will not determine at present. Yet I have found this a very good way too, and have made an Incision in the *Bark* near the Top, as long as the *Graff* requir'd; then opening the Incision with a little Ivory *Grafting-Knife* with a good Edge, I there thrust in the prepar'd *Graff*, so as that the Place where its *Bark* was peel'd off was turned outwards, and joined to the *Bark* of the *Stock*. This Place must be cover'd with *Grafting-Wax*, and the whole bound up with *Bass*. Nevertheless, you must put on both sides, between the *Ligature*, a Bit of loose *Bark*, that it may bind the tighter; for if they do not press closely one upon the other, there grows a kind of *Callus* or Excrecence, which not only deforms the whole *Tree*, but is a great Prejudice to its Growth.

Though this Method gave me a great deal of Pleasure, yet still I was not satisfied, but was earnest to discover some other better ways of Improvement. To that end I visited, from time to time, the fine Country Seats at *Kumpfmuhl*, a little Village a quarter of a League from *Ratisbonne*, where we sometimes find very understanding *Gardeners*. Among others, I found one occupied in Inarching a *Lemmon-tree*, which he did in the following manner: He placed a wild *Lemmon-tree* in a Pot near a
fruitful

fruitful one, toward which he inclin'd it a little; then he chose a sound *Branch* of the bearing *Tree* and bowed it towards the wild one, to see whether it would match well with it as to height and thickness. Having found all right to his mind, he cut the wild *Stock* sloping just under the Crown, and smooth'd it well with his *Grafting-knife*, then he slit the *Stock* as the custom is in common *Grafting*, and placed the crooked *Branch* only at the entrance of the Gap, so as the Barks bound closely one upon the other, and the *Branch* stood upright. Before this he had cut the *Branch* a little on both sides (where the Insertion was to be made) from the Bark to the Wood; afterwards he bound up the grafted Place as in the ordinary way, and setting up a Stick near it, he tied the *Stock* to it, that it might not be hurt by the shaking of the Wind. As soon as the *Branch* began to shoot anew, (which happens commonly in less than six Months) and that he found the *Graft* to be well join'd, he cut it from the bearing *Tree*, and left the young *Graft* to feed only upon the wild *Stock*. This is a very pretty way, and is infallible, in as much as the wild *Stock* contributes jointly with the bearing *Tree* towards an abundant Nutrition, till the *Graft* has taken. The same *Gardener* took an occasion, while I was with him, of speaking of a Multiplication by Union, which he thus perform'd. He placed a wild *Orange-Stock* near a fruitful *Tree*, and after having pick'd out a sound *Branch* of each, and cut a little of the Bark and Wood from each of them, about two or three Inches in length, in the place where they were to embrace or be join'd together, he closed them strictly one upon the other, each remaining upon its *Tree*, and then plaister'd them with *Grafting-Wax* and tied them: In this manner the *Branches* grew one within the other, and when he saw they were perfectly united, he cut the *Branch* of the bearing *Tree* so that it remain'd join'd with the wild one, which by this means was improv'd. We must observe during this Union, that to prevent the agitation of the Wind we

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must tye the *Trees* to little Sticks. The same thing may be done by *Fruit-Trees* when they are near each other. The Operation, which we may call *Embracing*, is very like this, and is perform'd as follows; we put the *Branches* cross-wise one over the other, and then make an Incision in each *Branch* in proportion to the thickness of the *Branches*, then we plaister them over with Graffing-wax, and bind them as aforesaid. Though these two different methods can't be us'd with respect to all *Trees*, because they often are at too great a distance one from the other, and the *Branches* cannot be easily brought together; yet these are Inventions not to be despis'd.

I ask'd this same *Gardener* what they meant by Inoculating, and Oculating with the Scutcheon; he told me they were one and the same Operation, equalling if not surpassing all others, and consisting only in taking a *Bud* from one *Branch*, and fixing it dextrously in the *Rind* of another; the ordinary way is this: They cut a good *Branch* full of *Sap*, on which there are four, five, or more *Buds* of the same Year; the *Cions* or *Branches* are generally taken from the *East* or *South* side of the *Tree*, out of which they chuse the best *Bud*, and chiefly that which is of the brightest Red, and of a fine Leaf, then they make an Incision on the upper part cross the *Branch*, and two others, on each side one, almost joining to that on the upper part, so as to form a kind of Triangle about the *Bud*; some cut the *Rind*, to which the *Bud* is fasten'd, Lozenge-wise; others cut it Square, and call it, *Inlaying*: But this is a different Operation, as I shall hereafter make appear. When the Incision is made about the *Bud*, they loosen it a little with the point of the Knife, on which occasion 'tis better to make use of an Ivory Knife than one of Iron, which if it is any way rusty taints the *Sap*, and is very prejudicial to *Trees*; then they take the *Bud* between two Fingers, and moving it gently from side to side, get it free from the woody part of the *Cion*; if they find a little Gap in the *Bud*, it is good for nothing, for
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in that case the Heart of the *Bud*, which includes the whole *Tree*, *Root*, *Stock*, *Branches*, *Flowers* and *Fruit* (as does the Kernel of any *Fruit*) remains with the *Branch*, and then they must look out for another sound *Bud*.

When they have succeeded well in taking it off, they take the *Leaf* of the *Bud* (not the *Scutcheon* or *Rind* to which it is fasten'd) into their Mouths till they have made the Incision where it is to be placed, which (after the ordinary manner) is made across in form of a T as large as the *Bud* requires, and this must be done with Speed, that the Air may not damage the *Bud*. This Incision and the loosning of the *Bark* is done best with the little Ivory Grafting-Knife. As soon as this is done, they thrust in the *Rind* to which the *Bud* is fasten'd, so as the pointed end is down, and the large end upward, and they hold it by the two Sides, then they tye it with Cotton Thread, or with Bass, neither too tight nor loose, for either would spoil the whole Operation. Some say there is no occasion for tying at all, especially if the cross Incision be made at bottom, and the long one upward like a reversed J, as the well-known Inventor of this reverse way of *Inoculating* used to do, who was formerly Counsellor of Commerce at *Berlin*, but since reduc'd to the Condition of a Pensioner of the Senate of *Nuremberg*, who are capable of giving a Certificate of his good Behaviour. I spoke to him six Years ago at *Nuremberg*, before that Misfortune hapned to him; but he was then so sensible of a Loss he had lately suffer'd, that I could not get a reasonable Word from him, therefore I left him and went to the *Jews Garden*, where the *Gardener* was so civil as to shew me his ruin'd *Trees*, and at the same time the reverse way of *Inoculation*: As he went too roughly to work in cutting and hacking his *Trees*, and did not observe the proper Seasons, his Undertakings succeeded very ill. We must nevertheless allow that he has deserved well of Posterity, as being the first Inventor of reverse *Inoculation*. For my Part, I very well approve of the Grafting Instru-

ments of his Invention. I am certain too, that Mr. *Frederick Kuffner* Minister of *Lichtenberg*, in the County of *Brandenburg Bareith*, would never have fallen upon those Thoughts in his fine Treatise of a new Discovery concerning *Trees*, if that Gentleman had not led the way. And certainly that Minister must have taken notice of the 6th *Fig.* in his Work, which is not done according to Nature, for I know the Figure of those *Trees*, and how they grow, having *Inoculated* several of them as well after my first method, as according to my improv'd manner, of which I shall make mention hereafter. To conclude, I must confess, that if I had known nothing of reverse *Inoculation*, I should never have attain'd to an *Universal Multiplication* of all *Trees* and *Shrubs*, as will appear by what follows.

§ 5. As to reverse *Planting* and *Inoculation*, when I had made some Progress in those Arts, I begun to take a great delight in them, especially in *Graffing*, for I never had any doubt as to the possibility of the Operation, though it seems to oppose the ordinary course of the Circulation of the Humours, since I knew the Connexion of the Parts of *Trees*, and that the Matter of the *Callus* through which the *Sap* filtrates itself ought to do the office of a *Root*; I was therefore the more earnest to make a trial of it upon my *Trees*. 'Twas pleasant to see how I lopped them; I cut and hack'd 'em into ten, twenty or more Pieces; I generally placed two *Graffs* athwart in the *Cleft*; I *graffed* thus about sixty *Graffs* upon one thick and high *Stock*; but hardly a Month had passed, when I found all my labour had been vain; however I found here and there a *Graff* that had shot out, and thereby I was convinced that I had used too much Violence in the Operation, therefore I resolv'd for the future to treat my *Trees* more gently, for a small Wound that does not penetrate far may be more easily cur'd than a deeper, so that I began to make my Dispositions in the following manner.

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As to *Inoculation*, I chose for the purpose a young *Plumb-Tree*, tall, streight, and smooth, on which I *inoculated* after the reverse way in the middle of *August*; I did not Lop off all the *Head*, but only some *Branches*, for I saw no reason to use my *Tree* so roughly, especially when I consider'd that thereby I should do the *Buds* more harm than good, for the *Sap* which rises in great plenty, especially at that time, must necessarily choak the *Buds*; but when the nutritive Juice finds room to diffuse itself in the *Branches*, till the *Buds* become united with the *Stock*, there is no danger. Thus I reasoned, Suppose the *Buds* should not shoot, yet I shall preserve my *Tree*, which will serve for another Operation, and it will be time enough when the *Buds* begin to sprout in the Spring, and have need of more of the nourishing Juice, to take off the Head of my *Tree*.

I kept the order which Nature prescribes in inserting the *Buds*, and did not follow the method of the Minister *Kuffner*, who always plac'd two *Buds* opposite to each other, which may happen to succeed sometimes, but there is often a great deal of difficulty in it by reason of the callous Matter which thrusts itself out with great force, as may be seen in N^o VI. On the contrary, I placed my little *Buds* about the length of my Hand one from another, winding from the one side to the other, which I continued from the bottom to the top. I made a Perpendicular Incision, reaching down to the *Bud*, at the bottom of which I made another horizontally as far as the Wood, then with a Chizel, which I use for *Inoculation* (that is to say with the Ivory part) I raised the *Bark* a little, and held the Chizel so as that the hollow side was next the Wood, then I put the *Bud* traversewise, with the *Rind* on which it grew, into the Incision of the *Bark*, so as that the point of the *Rind* was turned towards the top, and the large end towards the bottom, for I always cut the *Rind* of the *Bud* in form of a Triangle, of which the two Sides were something longer than the Base. We have already

already shewn the easiest way of raising the *Rind* of the *Bud*, but if that will not do, you make use of the other end of the Graffing-Chizel, which resembles a Wimble; and when the Incision is made you must raise the *Bud*, so as taking it below by the Point, you may thrust it up and cut it: If you should chance to cut any of the Wood with it, you must take it clean off with the Graffing-Knife; this way is the most expeditious. The Inventor, in the little Treatise he has publish'd, gives the Reason why this cut of the \perp is better than the common one, *viz.* because when the Incision is so made, the Rain cannot penetrate into it, as it often does the common way; when the *Bud* was thus placed, I clos'd and plaister'd over the Lips of the Incision with Graffing-wax, and tied them at bottom with small Strings of Bass; and thus I never lost a *Bud*, they all sprouted to my great Satisfaction in the Spring, and by means of their bending grew upwards in a very singular manner; then I cut off the Head of the *Tree*. If I had a mind that the *Stock* should be tall, I only lopped off the *Branches*; if I desir'd only a low *Tree*, I cut down all to the Crown, and dressed the top well with Graffing-wax; the issue of all this was, that the *Sprouts* above grew thicker and stronger than the lower ones; whereas I imagined that those which were nearest the *Root* would have grown most speedily and best, as having more of the nourishing *Sap*; so that my *Graffs* grew like a Pyramid reverse, which was no agreeable sight. But after examining the matter a little, I found the fault was not in Nature, but in my self, in taking the *Buds* off the *Branch*; for in holding it with the great end upwards, I took off the less perfect *Buds* first, as being in that situation undermost, while the larger and better *Buds* were uppermost, and plac'd them accordingly. Besides, since the larger *Buds* were already perfect and in good state, and since 'tis well known that the volatile and subtile *Sap* ascends the most easily, therefore the upper *Branches* grew better, and became thicker and stronger. On this occasion I immediately

mediately revers'd my *Branches*, and placing the *Buds* of the small end, as being the largest, towards the bottom, and the lesser *Buds* of the *Branch* above, I acquired a handsome and regular Pyramid, for then the latter could not grow so well as the former; now as it often happen'd that I could not find above three or at most four perfect *Buds* upon a *Branch*, whereas I had occasion for a good quantity to furnish the *Tree* to the top, therefore I provided a sufficient number of the like *Cions*, from which I took the best *Buds*, and then I put them in Water till I had occasion for the lesser sort too. And thus, as I've already said, I obtain'd a very fine Pyramid, which being so beautiful I placed it on a handsome Pedestal, divided into two Parts, as in the Plate.

When I saw my self in a good way as to *Buds* of the first *Sap*, and which had but a single Leaf, it came into my Head to try with *Shoots* of two, three or more Years old, believing that as they were already older than the former, they would grow the faster on my Pyramid; when in order to this I had loosen'd these *Buds* and tried to raise 'em with my Finger, I found it in vain, the *Buds* being too well fix'd to the Wood, I therefore took my Grafting-Chisel, and putting it into the Incision by the hollow side, raised the *Rind* and the *Bud* together; and if there came any of the Wood with it, I took it off carefully with the Grafting-Knife. I had always a special regard to their Age, and took care to place those of four Years old at bottom, and so upward according as they were younger; in this manner it often happen'd that all these *Buds* began to shoot in three, four, or five places, which was very pleasant, and therefore I have caused it to be drawn.

§ 6. After I was become wiser by the reverse *Incision* of *Buds*, and had discover'd the same Fault in my grafted *Trees*, I corrected it in the following manner: First, I learn'd to know the age of a *Branch*, and after some Experience, I found that some
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were nine, ten, twelve, and even sixteen Years old, this I discover'd by certain little Circles about them ; but when a *Branch* had pass'd that Age it was more difficult to know it, tho' there still remain'd a Mark which requir'd a great deal of attention to distinguish. By this Contemplation I had no difficulty in telling the Age of a *Tree*, always allowing some Years more to the principal *Stock*, which I have given Proofs of to some very knowing Persons, telling them the Age of their *Trees*, and have seldom failed. This discovery was so useful to me that it gain'd me a very beautiful Pyramid ; I procur'd a great many long *Branches*, and took an account of their Years, as well those of the Greater *Branches*, as of the Side-ones, which must at least be a Year younger, for the Off-spring cannot be older than its Mother ; and thus I obtain'd *Graffs* of five, four, three, two, and one Year old, which I made use of in the reverse Method, but in two different Manners ; some I grafted in the *Bark*, and others in the *Bark* and *Wood* too. According to the former method (which was very successful, the *Graffs* generally coming to good) I first made an Incision length-wise, and then another athwart, as in the *Inoculation*, making at the same time a pretty large Notch at the bottom for the better fixing the *Graff*.

I cut the *Cions*, (especially those which were to be plac'd below) of such a length as that there remain'd on them four or five *Buds* ; then I grafted them between the *Bark*, first making an Incision in the *Graffs*, broad on one side, and pointed towards the bottom ; afterwards I gently took off from them the brown *Bark* on the round side, and then rais'd up the *Bark* of the *Tree* with the Ivory part of my Grafting-Knife, and put therein my reverse *Graffs* ; and then to prevent any callous Excrecence, I put between both on each side two little bits of doubled *Bark*, after having dress'd the Place with prepar'd Wax, and made the proper Ligature upon it. I grafted in the same manner towards the Top in the *Bark*, but there I turn'd the Incision, making
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the transverse Cut a-top, and the perpendicular one downwards. I thus grafted ten or fifteen *Grafts*, a Span distance one from another, placing them winding, as I had done in Inoculating with the *Rind*. Above I placed the young *Cions* of one or two Years old, which had but one or two *Buds*; then I took older *Branches*, which had more *Buds*; and at last large *Grafts* of three, four, or five *Shoots*; and thus I got the finest Pyramids in the World in a regular Symmetry from top to bottom. What follows will serve to instruct those who would *Graft* the reverse way, both in the *Bark* and *Wood*. You must make a transverse Incision in the *Bark*, then make a Cut of the breadth of your Finger, and a little deeper in the *Wood*, then put the Grafting-Knife into the Incision, and with a Mallet drive it upwards, and make an Incision in proportion to the length and thickness of the *Graft*; and to keep it open, thrust in the little Ivory Knife, or a small Wedge of Wood, that it may not close, then slide in the *Graft* by the wide part of the Notch, which grows lesser upward, and that it may fit the better, make another small Cut above the *Graft*, after which dress the Incision with Grafting-Wax and bind it; they that please may put two *Grafts* into the same Incision, but I have already said why I never put more than one. I should have a great deal still to say on this Subject of reverse *Planting* and *Grafting*, having employ'd my self very much in it, but as I treat at present of the *Multiplication*, and not the *Improvement* of *Trees*, I leave it to Mr. *Kuffner*, who has been very Fortunate, and who has already publish'd some fine Discoveries on this Subject.

We should say something of the manner of *Multiplication* by *Tube* or * *Flute*; but this Operation is nothing but taking off at once, two, three, or four, or more *Buds*, from a young *Branch*, and fixing them upon another *Branch* or small *Stock*, which is

* We call it so, because the loosned Bark, as the Author describes it, resembles a Flute.

perform'd in the following manner, and may be done in Spring as well as Summer, when the *Trees* have shot, and the *Bark* separates easily. We must choose out a sound streight *Shoot* of the same Year, and cut it off near the Joint; then we must make choice of two or more *Buds* which are proper for this Operation, and cutting the *Bark* quite round at the great End, we must move it up and down to loosen it from the Wood, and when it is slip'd off, we are to choose a *Branch* of another *Tree*, of a suitable length and thickness, which in like manner must have its *Bark* strip'd off, then put on the other *Bark*, (which is in the Form of a *Tube*) with its *Buds* in its stead, after which it must be arm'd with Graffing-Wax, and tied; but upon trial, this Operation will be found very troublesome as well as uncertain; for in the first Place, we are not sure of slipping off all the *Buds*; if there are two good ones, perhaps the third will be worth nothing; and if there be any cavity in it, the *Tube* is good for nothing; besides, in pressing and striking upon it to get it off, you bruise and squeeze the little *Channels* and *Nerves*, so that the *Tube* seldom comes to any thing. This Operation seem'd very troublesome to me, till I had found the following Expedient; I chose a *Branch* with four or five *Buds* following each other, then I made an Incision down the whole length of the *Branch* with my Knife, and carefully took off the *Bark* with the *Buds*; I then sought for a *Branch* growing upon some other *Tree* which should be a little bigger, and measured a length exactly adapted to that of the *Tube*, and took off the *Bark* from it, leaving only a long narrow *Slip* to which I fitted the *Tube*, ordering it according to Art. But the aforesaid Author mentions more Circumstances of this Operation. We must now take a little Notice of another Method of *Inoculating*. call'd *Inlaying*, which consists only in cutting a Triangular or Square piece out of the *Bark* of a *Tree*, and fitting a like piece of another *Tree*, with a *Bud* on it, exactly to the place, which must be afterwards dress'd

dress'd with prepar'd Wax and tied. This way is very certain and infallible, and is soon done, so that I am surpriz'd that it has been so little writ upon: But I believe Mr. *Kuffner* will treat of it more largely.

§ 7. To conclude, I ought to acquaint my Reader how this reverse Method of *Inoculation* and *Grafting* came to inspire me with the thoughts of an *universal Multiplication*. Being one Day at Work in private, as usual, I receiv'd an unexpected Visit from some Friends, and was oblig'd to leave my *Grafts* unplaster'd and untied; they happen'd to stay till Night; and in the Morning early I was called away to see some Patients in the Country, so that it was some Days before I could return to my *Garden*, which when I did, I found my *Grafts* dead, therefore I took 'em out and cover'd the Incisions with Grafting-Wax. In the mean time there appear'd upon one of the *Branches* a callous Matter, in which one might perceive the first *Fibres* of *Roots*, and when I had put this *Branch* in Earth, there grew out of it perfect *Roots*; this occasion'd me a great deal of Joy, and I thought that if the same happen'd to all *Leaves*, *Shoots*, *Buds*, and *Branches*, one might thereby make an Increase from them all; and hence arose the first System of *Universal Multiplication*. When I continued to make this Experiment, I found that upon making a convenient Incision, and ordering it as it ought to be done, there always came out a like hard Substance, which appear'd to be not only an over-flowing of the Juices, but the very Substance of the *Roots*; for there might be observ'd as many Points as there proceeded *Fibres* and little *Roots*, as we shall demonstrate by and by. In this Disposition I thought it would be necessary to know what the Learned would say to the Matter; and having then but few Acquaintance among them, I endeavour'd to make it known by my invitational Letters, which being dispers'd in all Parts, there happily came one to the Hands of the

Empress *Amelia*, who having a great Love for *Gardening*, was pleas'd to favour my Discoveries.

In order to this, her Majesty sent Prince *Loewenstein* (Plenipotentiary of the Emperor to the Diet of *Ratisbonne*) to enquire what this *Universal Multiplication* was, as is to be seen more at large in my *Succinct Account*. In the mean time I proceeded to better Thoughts, on the manner of putting my Project of an *Universal Multiplication* in Execution, which I communicated to Count *Wratislaw*, Envoy to the Diet in this City, who is a great Lover of *Gardening*, and very Intelligent in it, and the Subject was argued *Pro* and *Contra*, as may be seen in the same Account. And to the end this System for the *Natural* as well as the *Artificial Multiplication* might be more generally known, I resolv'd to put Pen to Paper and print it; but my Circumstances not allowing me to undertake so tedious and expensive a Work by my self, I requir'd the Assistance of some Lovers of *Gardening*, which they readily sent me, and their Bounty gave birth to this Work. This is a short Relation of the Original of my *Universal Multiplication*, I shall next proceed to discover the Foundation on which the whole Work depends, together with several manners of Operation, as well for *Trees* and *Shrubs*, as for *Flowers*.

P L A T E VII.

Description of several Manners of Improvement taken from divers Authors.

(a.) Represents how the Operation of Graffing in the Cleft is perform'd with the Graffing-Knife, near the Pith, but not within it.

(b.) Manner of double and triple Graffing.

(c.) How we Graff in the Cleft. The Cleft must be plaister'd with Mummy instead of Graffing-Wax.

(d.) This



(d.) *This little number of Graffs shows how we go about to Graff on the Branches of Trees, provided all the Branches are shortned, as the Text explains, which in few Years will produce very good Effects.*

(e.) *Represents a manner of Graffing, which is called Graffing between the Bark, which exceeds the common Manner, it having a more certain and speedy Success, as appears by the Description. The Stock is here represented larger than it ought to be, to show it more clearly.*

(f.) *Represents a very useful and certain Operation which is called Inarching. The Inventor of it certainly had fine Thoughts.*

(g.) *How the Operation of Graffing is perform'd by Union, or Caressing; this is not proper for large Trees, but does well for Foreign Trees, which may be placed one near another. This Manner deserves to be well consider'd, since it comprehends a great many Mysteries of the Art.*

(h.) *How that is perform'd which is called Embracing, or Twist Grafting; this Manner also can seldom be practis'd on large Trees, and ought chiefly to be used on those which are very near one another: We shall show in its proper place, the Advantages which may be drawn from it for Foreign Trees.*

(i.) *A fine Operation, which is call'd Inoculating with the Scutcheon. The Books of Gardeners show the common way, but here you'll find a reverse manner, which relates to the following Figure.*

(k.) *Manner of Multiplication with the Tube.*

P L A T E VIII.

The new manner of Cultivating Trees, which I have improv'd both with respect to Inoculating and Graffing.

Fig. 1. *A high Stock which had shot vigorously, in which is shown (in some measure) the manner of Reverse Graffing.*

(a.) *A*

- (a.) *A perpendicular Incision in the Bark.*
- (b.) *The transverse Incision, and the Entail.*
- (c.) *How the Scutcheon must be raised with the Graffing-Chisel, chiefly with the Ivory part.*
- (d.) *Is the Bud revers'd.*
- (e.) *Manner of Plaistering with the prepar'd Wax, and making the Ligature.*
- (f.) *How the Bud some time after begins to shoot in a curvilinear Form, and then sprouts upwards, which is that in which the whole Work consists.*

Fig. II. *How the Shoots of one, two or more Years are fix'd to a Tree, with their Leaves a little cut, so as that the Wind may not have too much Power on them; as also the way to know whether the Graffs have taken or not.*

Fig III. *The Fault which the Author committed in holding a Branch in Graffing. See Plate 7. N^o 1. Chap. 2. § 2. The Figure (g.) represents the large End, where the Buds are not so perfect as at the small part; and how the Scutcheon is cut so, as that the Point turns upward, and the broad End downward. (h.) Is the Amendment of the Fault; the End of the Branch having been held upward, the upper Buds removed and plac'd below, and the Scutcheon revers'd, the large End being placed upward, and the Point downward, which produc'd a regular Pyramid.*

Fig. IV. *How we may know what Age a Tree is of, which is absolutely necessary in reverse Inoculation and Graffing, being the principal Foundation of them.*

Fig. V. *A new and diverting Operation in the reverse Method of Graffing in the Bark; and how it may also be done in the Wood. In this Figure you must observe the Symmetry, in order to see how to place the Graffs in a proper manner. (i.) Is a Graff of one Year; (k.) of two; (l.) of three; and so of the rest. This produces a handsome and regular Pyramid.*

Fig. VI.

Fig. VI. *How the Head is lopped off; and how the Stock sprouts with one Branch.*

Fig. VII. *Represents an Apple-tree in a reverse Manner, which has grown well in my Garden several Years, has blossomed, and born Fruit. Many Persons of the first Rank have come to see it.*

C H A P. III.

Of the different Manners of Artificial Multiplication, and whatever is requisite thereto.

§ 1. **I**F there ever was a Philosopher in the World that left any thing profound and ingenious to Posterity, it was certainly *Hermes Trismegistus*, whom we may justly call the Prince of the most occult Philosophical Knowledge, and Father of all Philosophers, since 'tis said he lived before *Moses's* time. 'Twas he that open'd the secret Gates of Nature, and explain'd to his Disciples and Followers inestimable Mysteries; therefore they also called him (*ter maximus*) *the thrice greatest*, not only because he possess'd the great *Ternary* of Secrets, but also left it to Posterity in a kind of Testament, written upon a Table of Emeralds, which is said to have been found in his Tomb, by the Tenour of which any one may perceive him to have been a superiour Genius. That Inscription is couch'd in these Terms.

'It is certainly true, nay most true, that what is above is as
' that which is below, to execute the Wonders of Unity; for as
' by the Contemplation of Unity, all things are from One; so in
' this, all things are made by One, by means of Conjunction or
' Union.

‘ Union. Its Father is the Sun, or Gold ; Its Mother the Moon,
 ‘ or Silver. The Winds bore it in their Bosom. Its Nurse is
 ‘ the Earth, the Mother of Perfection. Its Strength is perfect,
 ‘ when converted into Earth: therefore separate the Earth from
 ‘ the Fire; the Subtile from the Gross, with a particular Know-
 ‘ ledge and mature Judgment; then it ascends from the Earth to
 ‘ Heaven, and descends again from Heaven to the Earth, where
 ‘ it draws to it self the Force of Things superior and inferior;
 ‘ and in this manner you shall acquire the Glory of the Universe,
 ‘ and drive all Obscurity from before you, in as much as herein
 ‘ is the great Power above all Powers; being also able to pene-
 ‘ trate thro’ all that is subtile, thro’ all that is gross, and thro’ all
 ‘ that is hard, and to subdue it. In such manner was the World
 ‘ made; and from thence result its marvellous Conjunctions and
 ‘ Unions, as also their surprising Operations. And since this is the
 ‘ way by which the most surprising Things are effected, therefore
 ‘ am I called *Hermes Trismegistus*; that is to say, *Thrice greatest*,
 ‘ because I possess three Parts of the Wisdom of the World, and
 ‘ the Investigation of the Nature of the Universe, with which I
 ‘ end my Discourse of the Work of the *Sun* or *Gold*.

Though it cannot be denied that these Words regard only the
Universal Tincture, I may nevertheless apply them very perti-
 nently to the *Universal Multiplication of Plants*. Therefore I
 shall explain it not in an abstracted and metaphysical Manner,
 but physically and clearly, to the End that every one may suc-
 cessfully exercise himself in this Work.

In the foregoing Discourse we have shewn at large, that there
 is a living Essence in *Plants*. When this leaves its Centre it en-
 tirely occupies the Parts of the *Plant*, whether they be in the
 Earth, or above it; to which the Saying may be apply’d, that
 the Whole is included in a Part, and the Part in the Whole; so
 that this whole vegetative Soul may be in the whole *Tree*, and
 at the same time essentially in the smallest Part. And this is
 the

the more easily to be comprehended, since it is allow'd that the vegetative Soul is material, and capable of a Division into innumerable Particles, so that it may inhabit the most minute Part with its whole Essence, and gradually perform its Work, as may be demonstrated by the Effects. Nevertheless, the Organs must be duly dispos'd by Art; for if they be entirely destroy'd, the Soul is likewise lost. This appears somewhat difficult to vulgar Apprehensions, but the Effect witnesses for the Cause. Every one must allow, that as long as the vegetative Soul is in a proper State, that is to say, in a sound *Tree*, it may exercise its Functions; but in case the Head should be separated from the *Stock*, and the *Trunk* from the *Root*, how should it then act and perform its Functions as before? Certainly, one would think the *Trunk* and the *Roots* would then be but a lifeless Being: But Experience shews us the contrary every Day; and they who consider the Matter, will find that God has prescrib'd Laws to vegetative Souls, different from those he has given to the Souls of Animals: For the latter abandon their Body as soon as their principal Parts are hurt; but vegetative Souls can remain essentially a long time in their Bodies, though all their Parts, as well superior as inferior, are divided, and cut into many pieces; and if they are help'd, they maintain themselves as well in the superior as inferior Parts, and exercise the same Functions they did in the entire *Tree*, when it was yet undivided. And it is upon this great Principle that I may make use of the admirable *universal Sentence* of *Hermes*, and apply it to *universal Multiplication*; for he says, *Quod est superius est sicut id quod est inferius, & quod est inferius est sicut id quod est superius*; that is to say, the *Branches* are as the *Roots*, and the *Roots* are as the *Branches*; which is as much as if he had said the Top is compos'd of the same Parts as the Bottom, and the Bottom also is the same as the Top; or still more clearly, the *Branches* are *Trees* and take *Root*, and the *Roots* are *Branches* and become *Trees*. That I may explain

my self in the clearest and most intelligible manner, I shall make use of the two Figures here annex'd; I say then, that one may make *Trees* of all the perfect *Branches* which are in the Head, for they want nothing but *Roots*; and the *Roots* may become *Trees*, for they want only *Stocks*, which Experience shews; for it has already appear'd from so many Operations which I have propos'd, as well for the *Multiplication* as *Improvement* of *Plants*, that by means of such and such Incisions made in the *Leaves*, *Shoots* or *Branches* (provided they be made as they ought) the *Leaves*, *Shoots* and *Branches* take *Root*. Now if the *Roots* were not included in them materially, how should they come out? For of Nothing comes nothing. But as they shoot out in all places, it follows necessarily that the *Roots* are in the *Stocks*, as may be seen by the Eye, and as my Experiments will prove still better. It is then certain that there are as good *Roots* at the top of the *Tree*, as at the bottom of the *Trunk*; and who is there that is not sufficiently inform'd by the aforesaid Experiments (especially if he consider the burying of a large *Tree*, and the growing of the *Suckers*) that there proceed from the *Root* a great Number of *Stocks* and *Trees*. And when I divide a *Root*, according to Art, into a hundred Parts, and set them in the Earth, every Piece gives me not one, but four, five, six or more *Stocks* furnish'd with *Branches*. Now if they were not in the *Roots*, they could never come out of them; so that it is certain that the Top is the same as the Bottom: and this will be the sooner comprehended, if we call to mind what I propos'd as a matter of Speculation, viz. that the inferior Part of the *Tree* has all the same essential Parts as the superior, what Names soever we may give them; for the Difference between the *Stock* and the *Root* consists only in that the *Pores* and *Fibres* of the solid *Parts* of the *Root* are more in number, longer and thicker than in the *Branches*, to the end they may attract so much more Humidity to them; and for the same Purpose it is that they widen by degrees.

But

But in the Structure of the *Tree* and the *Branches* the *Pores* and *Fibres* are more compact, as being more expos'd to the Air, Heat, Cold, and other Changes. Now that the nourishing *Juices* may the better ascend, the *Stock* grows lessening upward. And when by digging in Winter we root up a *Tree* entire, with its *Stock*, *Roots* and *Branches*, we can hardly determine, as it lies upon the Ground, which is the upper and which the lower Part of the *Tree*. But here it may be asked, how we prove that the *Roots* are as good *Branches* and *Twigs* under Ground, as those which appear above; for let us dig never so deep, we shall find no *Branches* nor *Twigs*, but only *Roots*. This is true. How then can I say that the Bottom is the same as the Top? To this I answer, That if the *Roots* were in the open Air as are the *Branches*, they would shoot out with numberless *Branches*, *Sprigs* and *Leaves*; but since they enter deep into the Earth, and have no free Communication with the Air, and partake not of the Rays of the Sun; therefore the *Branches* must not rest till we help Nature, though they are effectively there included. In the mean time we may perceive in *Roots* visible Marks of the Places from whence the *Branches* are to shoot. And when the *Roots* find a convenient Occasion, or are assisted by Art, then they grow upward apace, as appears clearly in those *Roots* which begin to shoot a little out of the Earth; for they immediately produce *Suckers*, which arise from the *Root*, and not from the *Stock*. We can hardly give any other Reason of this, except that then they receive most Assistance from the Air and Heat; for if the other *Roots* had the same Benefit, and were placed where they might enjoy the Air and Sun, they also would produce a great number of *Trees*. This will be clearly proved by the Experiments I have made, whereby what I have said agreeably to the Words of *Hermes*, will appear to be true, that the Inferior is the same as the Superior; and the Superior as the Inferior.

In examining my Figure more nicely, I find yet further Proofs, that what is at Bottom, is the same as what is at Top. For what is it properly that is at Bottom? We answer, *Roots*. How then can it be said with any Truth, that the *Branches*, *Twigs* and *Leaves* have *Roots*? And who has ever seen *Roots* grow in the open Air? To all this I answer; That it is nevertheless true, and that *Trees* have *Roots* above; nay, 'tis certain, that if People will open their Eyes, and look with Attention, they may at all times discover Millions of little *Roots*, with their small *Fibres*, in the *Branches* and *Twigs*. They may see distinctly in their *Bark* many little white Points and Marks of *Roots*, which perhaps no Body hitherto has taken notice of. But these cannot shoot unless they are put into the Earth; for then all these little Points open, and you hardly put a *Branch* into the Earth, according to Art, but it immediately takes *Root*. We see with Astonishment and Delight, how many *Roots* are gain'd by this Operation. Besides, all Lovers of *Gardening* know how by the Application, Incision, Inarching and Interring of *Branches*, *Shoots* and *Stocks*, we may render them capable of acquiring *Roots* sufficiently visible. By consequence it follows that there must necessarily be in these *Branches* and *Twigs* a quantity of proper Matter to produce the *Roots*, because they spring out whenever there is the least Opportunity of *Rooting*; which we shall demonstrate and treat of in its place.

Since, in my Opinion, the principal Foundation of *Universal Multiplication* consists in what I have alledged; for as much as we find, that in the *Branches* and *Shoots* of all *Trees*, *Shrubs* and *Flowers*, there is the Matter (or the Points and Marks) of *Roots*, which must be assisted by Art; as also that there are the like Marks in all *Roots*, from whence the *Stock* with their *Branches* proceed: I shall therefore propose upon this Foundation all the Experiments I have made, in order to convert in different Manners the *Leaves*, *Shoots* and *Branches* into *Roots*; and the *Roots*,
cut

cut to pieces, into *Trees*, and force them, by means of *Fire*, and my *Mummy* or *Grafting-Wax*.

First PROPOSITION.

Containing the Method of producing an Universal Multiplication, by cutting the Roots to pieces.

The Reader may remember what I demonstrated at large in my *Theory*, viz. that no *Plant* can grow without a *Root*, or something which may serve for a *Root*. Again, it has been prov'd that the *Roots* produce *Sprouts*; whence it may be inferr'd, that the *Roots*, when managed according to Art, must produce in all places the like *Suckers* or little *Trees*, which is what I shall endeavour to prove here.

I took up in my *Garden* several *Roots* of all sorts of *Trees*, as *Pear-trees*, *Apple-trees*, *Peach-trees*, *Apricot-trees*, *Walnut*, *Vines*, *Quinces*, white *Elders*, &c. as also *Lemmon-trees*, *Pomegranates*, *Laurels*, &c. and cut these *Roots* to pieces in all sorts of Manners. I took in the first place a very large *Branch* of a *Root*, and at the upper or great End, as also at the Places where the *Side-Roots* and little *Fibres* or *Overtures* were, I polish'd and smooth'd it; then I cover'd over this smooth End and the other Places with my *Mummy* or prepar'd *Wax*, and dress'd all the Places where there was any *Overture*; then I set it in Earth a Hand depth, so as that the little Parts of the *Root* might not take too deep hold: I left it extended at length, and but just cover'd it with Earth. Afterwards I laid on it good Earth press'd down pretty hard; in a little time the *Root* open'd on all sides, and appear'd as if it had been slash'd and cut, being full of little *Overtures*, which look like the Mouths of Fishes. From these Gaps there proceeded an infinite Number of *Sprigs*, great and small, intermix'd, which sprung up so fast, that in a Month's time they were above a Foot above Ground, and new *Roots* sprung

sprung out of the great *Root*; then I took it out of the Earth with a great deal of Satisfaction, and caus'd it to be engrav'd for the Benefit of the Publick, as the annex'd Figure represents.

Besides this, I took a piece of the *Root* of a *Peach-tree*, and cut it to many lesser Bits, each of the length of my Finger, or a little longer: I smooth'd the Ends, and dress'd them with my *Mummy*, or prepar'd *Wax*; then I planted them perpendicularly in the Earth, the small End downward, so as that the top of the *Root* stood out of the Earth about half an Inch. This I did in *June* and in *July*, and they sprung up, tho' in different Manners, some at Top, and some at Bottom, in a curvilineal Form. It was the same with the little new *Roots* which sprouted from the old, some of which were observ'd to shoot out below, and some above, as appears by the following Figure.

I used the same Method with regard to the *Roots* of *Vines*, *Quince-trees*, *Citron-trees*, *Pomegranates*, which all sprung out; and I have caus'd them to be engrav'd exactly as I found them.

But before I leave this Matter, there is a Question to be propos'd, *viz.* Whether this Operation may be practis'd on the wild *Roots* of *Trees* and *Shrubs*? For Example: The *Alder-tree*, *white Beech*, *Lime-tree*, *Willows*, *Ash*, *Birch*, *Oak*, *Pine*, *Wild-Plumb*, and *Juniper*. To which I answer affirmatively; for I have made Tryals of most, and they have succeeded; every bit of *Root* has sprung up; but I could not make Proof of them all, having too many other Occupations. Autumn being the most proper Season for this Work, (tho' it may be done also in Spring, and even in Summer) I intend then to make further Searches into this Matter; and will inform the Publick of my Success in the second Part of this Work; as also of what I may otherwise discover in these Undertakings for the Service of the Curious. They that shall put their Hands themselves to the Work, will be so much the better confirm'd. I shall now more distinctly describe this

Art

Art of increasing by Roots. A *Tree* may very well spare two or three great *Roots* without any Damage, provided the main or middle *Root* be not touch'd, and the Wounds be dress'd with *Mummy*; especially in a Wood, where *Trees* are felled, you may dig out as many *Roots* as you please; when you have taken several long and thick *Roots* from large *Trees*, cut or saw them to pieces about a Foot or Foot and half in length; you may take the smaller pieces and make 'em smooth with a Knife, but the larger you must put into the new invented *Root-bench*, and there smooth them as in the annex'd Figure. This Bench is very proper for the Work, it is about four Foot long, and a Foot and half high, before it is a thick Plank set perpendicularly about a Foot high, being hollow'd a little on the out-side so that a lesser Board may be fitted to it, and fastned with Hinges; this is likewise made a little hollow, that so they may together take the faster hold of the *Roots*; those who line them on the inside with Cloth, that the *Roots* may not be bruised, do well; on both sides you make two holes, thro' which there passes a Rope as far as the Foot-board, where there must be two other holes to stay the Rope, that when one treads upon it, and the *Root* is within, the two Boards may shut one against the other and fix the *Root*, but as soon as one takes off the Foot, the short Board opens and flies back of itself, by means of two Steel Springs that are between them, which shortens the Work very much. When you have smooth'd the Pieces of *Root* at both Ends with a Knife, then dress them with *Graffing-Wax*, which is made in the following manner.

Manner of preparing and using the Graffing-Wax.

Take four Pounds of common black *Pitch*, and a Pound of common *Turpentine*, put them in an Earthen Pot and set 'em on Fire in the open Air, but you must have something in your Hand to cover and quench it in time; cover thus the Pot several times, and
kindle

kindle it again, so as the *Nitrous* and *Volatile* Parts may evaporate; continue this till you think it is enough, the Proof of which is, when one pours out a little of this Matter upon a Pewter Plate and it coagulates presently; then pour this melted *Pitch* into another Pot, and add to it a little common *Wax*, mix them together, and keep it for your use. When you would dress your *Roots* with this *Wax* melt it, and let it cool a little, then dip in the two Ends of the piece of *Root* one after the other, but not too deep; then put 'em in Water, and afterwards in Earth, the small End downwards, so as that the larger End may appear a little out of the Earth, and have the benefit of the Air; press the Earth very hard down about them that they may not take too much wet, which would rot them; for my own part, I make use of a wooden Mallet, with which I beat down the Earth; and thus I deal with the *Roots* of all wild and Foreign *Trees*, *Shrubs*, and *Flowers*, as well as others. But if any one desires a better kind of *Wax* for tender *Trees*, they may make use of the following, which I call the *Noble Graffing-Wax*.

The Composition of the Noble Graffing-Wax, and Manner of using it.

Take a Pound of pure *Pitch*, which is called here (at *Ratisbonne*) *Virgin Pitch*, add thereto a quarter of a Pound of good *Turpentine*, set them on Fire that so the *Volatile* part of the *Turpentine* may evaporate, which otherwise is very prejudicial to *Trees* and *Roots*; when you have proved it, as we before directed (in our account of the Composition of the common *Graffing-Wax*) add to it a quarter of a Pound of *Virgin-Wax*, and a quarter of an Ounce of pounded *Myrrhe* and *Aloes*; when this is well mixed, make little Rolls, or else Plaisters of it; that is to say, when it is melted you may dip Linnen Rags in it; or else you may keep it in little deep Pots for use.

As for the time when the Operation upon *Roots* may be best perform'd, it succeeds well at any Season of the Year, as was said before; tho' indeed the Months of *September*, *October*, and *November* are the most proper for it. The only Difference is, that what is planted in Autumn comes not forth till the Month of *April*; whereas what is planted in the Spring will shoot in *June* or *July*. Here only remains one Query, *viz.* Whether any great Advantage is to be reap'd from the splitting or dividing of *Roots*? But of this I shall treat in the last Chapter.

Second PROPOSITION.

Containing the Method of an Universal Multiplication, by Cuttings set in the Earth, with the help of Artificial Heat, and prepar'd Wax, which may be practis'd on all Shoots, Sprigs, and Branches.

It might be proper to repeat here what we laid down as a fundamental Principle, when we treated of the upper part of a *Tree*, which is call'd *The Crown*; but for brevity's sake we shall only say, that a great number of *Roots* are included in the *Leaves*, *Shoots*, and *Branches*; this appears sufficiently from Experience, and is visible to the Eye; for such as have but a little Curiosity, need only, as was said before, examine carefully the *Stocks* and *Branches* of *Trees*, and they will clearly discover all the Marks of the first Principles of *Roots*. When the mention'd Parts of a *Tree* are cut off according to Art, are carefully kept, well bound up, and accommodated as they ought, they sufficiently prove the possibility of what Mr. *Laurenberg* said, when he undertook to multiply all sorts of *Plants* by *Cuttings*. But since he has only made a Beginning of this Work, I shall endeavour to carry it on a little farther, leaving it to others to bring it to Perfection.

I have to that end made such Search and Enquiry into this Method of working, as my time would permit. When for my Diversion I was inclin'd to raise *Trees* from *Leaves* without *Buds*, by cutting and laying them in Earth, particularly from *Citron*, *Lemon*, and *Laurel-Leaves*, as also from those of *Apple*, *Pear*, *Nut*, *Olive-trees*, &c. I treated them in the following manner. I took a fine sound *Leaf* without blemish or defect, but at the same time without a *Bud* joining to it; this I made even and smooth below; then I lighted a Candle, and taking my better sort of *Grafting-Wax*, which was made up in Rolls according to Art, as the Apothecarys Salves, or as the common Sealing-wax is usually made up, and softening it a little at the Flame, I dress'd the Wound I had made in the *Stalk*, to the end that no moisture might proceed from or enter into it; then I caus'd a pretty large and deep Pit to be made in the Earth, and planted the *Leaf* with the *Stalk* dress'd as above, so deep in it, that but a third part of it appear'd above the Ground. After this, the Earth was trodden in close about the *Leaf*, water'd a little, and skreen'd for some Days from the Sun's heat; this being done, the Substance of the *Leaf* decays by degrees, till nothing of it remains but the *Stalk* in the middle, which gathers a callous Matter at the bottom, or else shoots out *Roots* on the sides, and in a Year's time acquires *Branches*. This indeed is a very pretty Curiosity; But of what use is it? Supposing a *Tree* should be thus rais'd from a *Stalk*, yet the Planter would scarce live to see whether it prov'd fruitful or unfruitful. That Satisfaction he must leave to Posterity; yet 'tis strange that no Writer mentions it; for my part, I can hardly think that such a *Leaf* without a *Bud* can produce Fruit, since a *Leaf* is no Essential part of a *Tree*; but as to this I shall assert nothing here.

In the mean while 'twill be far more prudently done to choose a *Leaf* with a *Bud*, since thus we may be better assur'd of Success. For this I have a twofold Method; sometimes I cut from

a *Branch* three or four *Buds* with their *Leaves*, dressing the piece thus cut off with my Wax; then I take off two of the *Leaves*, leaving one or two in the middle; the Wounds or Cuts I dress as before; then I set the *Leaf*, together with the *Buds*, lengthwise in the Earth, not too high nor too deep, as Fig. 1. shews it. I must also acquaint my Reader upon this occasion, why I so often give the name of *Mummy* to my Wax or prepared Pitch, it having been ask'd me several times. You must therefore know I called my *Grafting-Wax* by the name of *Mummy*, not because it is in every thing like the ancient *Egyptian Mummy*, but only because it has the same Vertue with that of *Egypt*, to keep any thing from Dampness and Putrefaction; but my Opinion is not that it can contribute any thing to the more speedy raising of *Plants*; I never thought of such a thing, it is only of use to keep the *Trunk* or *Stalk* from too great a Damp, as well as from the heat of the Sun, that so it may not be eaten up by Vermine; for the very same Reason that Coopers and Carpenters Pitch their Vessels and Boats, viz. to preserve them from rottenness. I have something still to say about *Leaves* with long *Stalks*, which is, that when I took a *Leaf* that had a long *Stalk*, I planted it so bent as to let the end done up with Wax appear above Ground on one side, and the *Leaf* on the other; and in this manner it took *Root*. 2^{dly}, I did the same with *Leaves* that had *Buds*, which being two or three Years old, were consequently more perfect. After I had dress'd all the Cuts, I planted the little *Branch* across as before, and spread the *Leaves* in the form of a Crown; and thus it often happen'd that those *Leaves* with their *Buds* came to be young *Trees*. 3^{dly}, I did the like with little *Branches* that had *Buds*; I took four *Buds* with *Leaves* growing near 'em, three of which I cut off with my Knife, and clos'd all the Cuts with the help of Fire and Wax; then I put them together into the Ground, so as to leave out but one single *Leaf* and a *Bud*; sometimes I turn'd the *Branch* the wrong End upward, leaving at the big-

gest End a *Bud* with a *Leaf*, and the others I put perpendicularly into the Ground, which made Nature without any further help produce a sort of reverse *Plant*, which shot forth very fine *Branches*.

As to the *Twigs* or *Branches*, I treated them after the following manner: I took a long *Branch*, as Fig. 2. represents it, and cut it into several Pieces, but so as that the *Branch* remain'd on the ancient *Trunk*, as *a, b*, shews it.

But if the *Branch* was pretty old, I cut it off, as shews *c, d*; and so I made a great many *Trees* out of a single *Branch*. Next I made the Pieces smooth, both before and behind, and clos'd them with Wax; sometimes I made several little Incisions on the Tops of them, but dawb'd 'em over with Wax; from those Incisions proceeded a sort of Callosity, and the *Bark* shot *Roots*; but when I endeavour'd to succeed better in my Operation, I exactly observed how old the *Twigs* were, and when I could find any about two Years old, I preferred them before any other, tho' I was sometimes oblig'd to cut off some *Branches*, which however I could have put to some other use, for effecting my design. When I met with such, I made them smooth, and carefully dress'd all the Cuts with Wax, that neither the natural Moisture might go out, nor any that was prejudicial get in; then I put two little forked Sticks to the *Trunk*, to keep it both streight and fast; and after I had tied it well, I laid it at full length in the Earth, pressing and beating down the Earth about it, as shews Fig. 3. and the *Branch* being thus in a standing Posture, I lopped its *Leaves* agreeably to Fig. 4. A few Days after the *Leaves* fell off, which was a good sign, and at last it was quite naked, as you may see in Fig. 5. Some Months after the *Buds* came forth again, as you see Fig. 6. and as Fig. 7. plainly shews it brought forth new *Leaves*; in this manner I made young *Trees* of all my Pieces, which shot at the bottom a vast quantity of *Roots*, especially those that had a *Twig* or two,
for

for from thence they shot forth sooner, as Fig. 3. shews at *e, f.* Besides this, I had made another Discovery, *viz.* I cut a *Branch* of two *Shoots*, or two Years old, and left a little of the *Trunk* to it; I dress'd it, as has been often said, and planted it perpendicularly, but the wrong End upwards; it sprouted at the Top, and shot *Roots* at the Bottom.

Before we have done with this Proposition, there remains a *Query, viz.* Which Season is the fittest for this Operation. I am for Autumn and Spring; but it may be also done in *July*, especially for Foreign *Trees*, but not so very well for *Branches* put into the Ground without any manner of Preparation, and which cannot be kept from the heat of the Sun.

This may be useful not only as to little *Trees*, but also as to the big ones in a Forest, as will be demonstrated in the last Chapter.

Third PROPOSITION.

Concerning the Universal Multiplication, that is effected with a newly invented Graffing-Chizel, through the Means of which the Matter of the Roots of all Leaves, Twigs and Branches is seen in Trees, and may be caus'd to shoot downwards, if thought fit.

AS I am forc'd continually to go back to the Basis I first built upon, if I pretend to prove any thing as true, it is certain that *Trunks, Stems* or *Stalks* have always within themselves a *Juice* from which *Roots* may grow. The Learnedly Curious won't deny the Truth of this Principle, as having experienced it themselves; but having searched further into these Matters, and those Thoughts coming by chance into my Mind, as I said in the second Chapter, I will more distinctly explain my self here. It is a Matter of Fact grounded upon Experience in *Gardening*, that if an *Incision* be made in a *Branch*, or old *Flower-Stem*, which
Win-

Winter has gone over, and if it be put into the Ground cover'd a little round about, and the Earth squeez'd close to it, a sort of coagulated Matter or *Juice* will discover it self by little and little; and that after a certain time *Roots* have been seen to proceed from that very Substance; or else, that after loosening the outer *Bark* a little, and so opening a Passage for the *Juice* to go out at, it has at last produc'd *Roots*. When I had discover'd this, and maturely consider'd it, I concluded that in *Trees* there must be every where a *Juice* fit for Nature to turn into *Roots*; for I could very well apprehend that the vital *Juice* of *Trees* must be an heterogeneous *Liquor*, as in Man the Mass of Blood is not homogeneous, since all other *Juices* separate themselves from it. In the *Entrails* the *Chyle* separates it self from the nutritive *Juice*, and is turned into *Blood*; and from thence comes the *Milk* into the Breast; the *Lymphatick Vessels* draw their watery Parts out on't; the *Liver* and the *Gall-bladder* receive from that *Mass* the bitter *Liquor* called *Gall*; the *Kidneys* and *Bladder* draw *Urine* to themselves; and the *Spermatick Vessels* the *Liquor* designed for the Propagation of the Species. In the *Brains* the nourishing *Juice* is severed from the *Blood* that has been driven up thither; in the *Mouth* the *Spittle*; in the *Eyes* the *Tears*; in the *Ears* that *Wax* which grows there, &c. Likewise as a *Tree* is made up of different Parts that want different *Juices*; so some are occasionally separated and distributed in this or the other Part; and in this manner is the *Juice* designed for *Roots* produced. When I was assur'd of the Truth of my *Theory*, I fell to practice as follows: I made in the *Leaves* with the little Root-knife, which is long and crooked, a little Incision (*viz.* at the back of the *Leaves* near the *Buds*) a-cross, and not deep, for fear least the Wind should break them; I put something between which I was sure could neither rot nor squeeze them too much, either a thin thread wax'd over, with the prepared *Wax*, or a bit of hard *Bark*, or a little *Cotton*, together with a little of the same prepared *Wax*,
and

and the Work was done. I did the like to all the *Buds* I had a mind to turn into *Roots*, always at the second or third Bud; leaving room between for the Earth to do its part, and dress'd the Wounds as I had done the others. Care must be taken not to make the Incision too wide, or too deep, all depending upon this; for if the Incision is too wide, the *Buds* do but dry up and die; and when 'tis too little there is not room enough for the *Juice* to work its way out, and bring forth *Roots*; it must not be too deep neither, but only as far as the third part of the Thickness of the *Stem*. What remains will be better learn'd by Practice; for one may improve even by often mistaking. As to the biggest *Trunks*, instead of the Knife the Graffing-Chizel is to be made use of: 'tis a late Invention, much like a hollow Wimble, as appears by the Cut.

But because one Incision is not sufficient for a *Trunk*, *Branch* or *Twig*, I repeated the Incision, according to the Bigness of the *Trunk*, &c. from three to twenty times and upwards, that so such a Callosity might every where grow out of it, as it also happen'd. This Method is as follows: I hold the Graffing-Chizel (one must have a good many, both great and small) against the Side, I knock it in with a Hammer as far as the Wood; then I raise it up with a little of the Wood, but not very high; next I take off the Chizel, and with a little Knife I cut off the sharp End of the forepart of the *Bark*, and make it a little broader, as you see in the Cut; then I take up what was raised, and slip under a little Cotton, by the means of a little Stick, or Ivory-knife. Lastly, I cover all the Incisions with prepar'd *Wax* or *Mummy* made liquid, and beaten flat as a Plaister; tho' it be better to cover every one of the Incisions by it self, with each a Bit, because Nature can then the more easily rid it self of the *Wax* at the proper time. When all this is well executed, one sees from Month to Month how *Roots* shoot out from the Cut or Incision: in two or three Months (tho' sometimes not sooner than four) that *Cal-*
losity

losity comes to its Perfection; for such is the Nature of a *Tree*, such is its Operation, sometimes quick, and sometimes slow; and when that *Callosity* is duly observed, one may see the top of the *Roots* in it, whereby one may be sure that the callous Matter has attained to the requisite Perfection, and at the same time that the *Root* is grown to the *Tree*. I tried indeed to help Nature with a little nourishing Plaister, but I found more Damage than Profit by it; and so I think it is better to let her alone, as knowing best what she has to do; take care only to provide as well as you can against Air, Dampness, Rain or Hail, and she always will bring whatever you intrust her with to a very good End. But because the *Roots* that have been carried up into the Air, and form'd there, can go no further, as not finding there the Nourishment requisite to their further Growth, they must be planted in the Bosom of the Earth, which is their Mother; or if you will have 'em plainly shew themselves upon the *Tree*, you must bring some Earth to them. Whoever will have the Pleasure of seeing the entire *Root* hanging at the *Tree*, let him take, when the *Callosity* has its full Growth, a Bag of Oyl-cloth fitted for the purpose, or any Tin thing answering to the same, fill'd with Earth, and tye it to it as the Figure represents it, and then the *Root* will shoot out in a very little while; then let him cut the *Trunk* or *Branch* down, dress it at the Bottom with *Mummy*, support it on both sides with Sticks, and so put it in the Ground; thus, let the *Branches* or *Trunks* be big or small, they will become perfect *Trees*. I have already explained in my *Succinct Account* what I mean by the Word *perfect*. I don't mean the Bigness of the *Tree*, as tho' it was grown perfect by that Operation, and brought to a full and sudden Growth, as several have imagined, wherein they have been grossly mistaken. They have been also pretty plainly told long ago, that when the *Branches*, *Twigs* or *Shoots* have got all their essential Parts they are perfect; for a *Trunk* or *Branch* without *Roots* is not perfect, and

and consequently is neither *Tree* nor *Shrub*; but when it has whatever is essential to a *Tree*, then it is a perfect *Tree* or *Shrub*. Likewise a *Root* is not perfect but when a *Trunk* or *Stalk* is grafted upon it, as we shall see by and by; for then it may be called a perfect *Tree*, since the *Root* and the *Trunk*, by their common Growth, give it such a Perfection. I must also here inform my Reader of what I have observed about such *Trunks* which had many *Callosities*, viz. that when they were planted, that Part of the *Trunk* at bottom which had no such *Callosity* perish'd; or being heated, the Heat communicated it self to the whole Substance; in which case I added a *Root* to it by a general Incision, either from that very *Tree* or another. I dress'd it next with the liquid *Mummy*, and supporting it with forked Sticks, committed it to the Earth.

But finding still some difficulty in it, because the *Root*, when set too deep in the Ground, met with something or other that damaged the Cleft, (tho' sometimes I met with no such Disappointment) I applied this Remedy, viz. I cover'd with *Mummy* only the *Callosities*, and set it so in the Ground, which succeeded very well, and the *Roots* shot forth on every side.

There remains only to fix the time when you may go about this grafting of the *Roots*; the best Season is *June*, *July*, and *August*; what is done in *September* or *October* not coming forth till the Spring. This Method may be used either for foreign *Trees*, or for common or wild ones, as also for *Shrubs* and *Flowers*, I mean those that remain the whole Winter; the Benefit whereof will be treated of in its proper Place.

Fourth PROPOSITION.

Of the Universal Multiplication by the grafted Root.

'Tis a Maxim constantly true; that nothing can be said, but what has been said before. Perhaps it will be thought, because

there is not the least mention of the grafting of the *Roots* in any Book of *Gardening*, (in none at least that I am acquainted with) that the working of it must have something in it either new or impracticable; but it has been proved in the very first Section, that such a way of working has been both known and practised above a thousand Years ago, as I have prov'd from St. *Paul's* Similitude; but since this way of grafting *Trees* is now quite out of use, tho' practis'd frequently, and with good Success, in former Ages, I have not only re-established that antient Use, but have added something that is new: It being the natural Course of all Things in this World for the old to become new, and for the new to grow old. But because I could not search into these Matters as was necessary, by reason of the Multiplicity of Business which attended my Calling, I desired the Curious to fall to work together with me, and to take all possible Care to restore to its former Perfection that way of grafting by the *Root*, as being grounded upon Nature, and consequently upon Reason; for, considering how Nature brings forth *Trees*, I discovered it to work by a sort of Ingraftment, grafting the *Trunk* upon the *Root*, as I demonstrated it in the former Section. Reason must also approve of this grafting *Trunks* and *Branches* with Judgment and Art upon the Principle of Life agreeably to Nature, the *Root* being the Fountain, into which, as well as out of which, the nourishing *Juice* comes, and spreads it self all over the other Parts, which entirely receive their Nourishment from thence: a Child may apprehend this. But before I went about grafting the *Root*, and communicating it to others, I made the following Observations.

1. That Nature had placed every *Trunk* upon a *Root*, and nothing could grow without *Roots*. 2. That *Roots* were made up of the same Parts with the *Trunk*; and the only Difference was the Largeness of the *Vessels* and *Pores*. 3. I observed from the Nature of the *Root* that it was full of a hard callous Substance; and

and that out of a split *Root* there came the very same Substance with that by which the *Trunk* and *Root* were as it were conglutinated and joined together, so as to become but one. 4. I was likewise positive, that when I split a bit of *Root* into several pieces, every one could shoot out new *Roots*, through which they might receive the nourishing *Juice* from the Ground, and disperse it among those Parts that wanted it. Those and the like Reflections put me upon executing my Project, which was to try, whether out of all the large *Trunks*, *Branches* or *Shoots*, I could make *Trees*, and bring them to Perfection, by a proportionable Application of *Roots*; for I was pretty sure of Success, as knowing a good big *Branch* has of and in it self great plenty of nourishing *Juice*; and if it be plac'd in, upon, or between the *Root*, the *Trunk*, which is entirely made up of little *Pipes*, *Pores*, &c. receives immediately, by means of the intimate Communication, a Supply of nourishing *Juice* which the *Root* when put into the Ground very quickly draws to it self, and then distributes to other Parts: Mean while, both from the *Trunk* and *Root* there grows a *Callosity* that surrounds the *Branch*, and joins one with the other, so as to make the two pieces but one. When I intended to raise *Trees* from *Branches* twelve or fifteen Foot in length and upwards, I proceeded in the following manner: Having got some *Roots* of the same kind as the *Trees*, (tho', for want of such, others of as near a kind as possible may be used, as shall be shewn hereafter) I cut them into Pieces of one or two Foot long, in proportion to the *Trunk* or *Branch*, chusing the thickest for the Biggest, and the thinnest for the smallest *Trunks* or *Branches*. But to go upon sure Grounds, it is better to set the Pieces of *Roots*, well dress'd, both at Top and Bottom, sometime before in the Ground, that so they may shoot new *Roots*. This may succeed, if the Pieces of *Roots* be planted in the Months of *March* and *April*; for then they may be taken up in those of *September* and *October*, and grafted upon; or else the *Roots* may

be put under Ground in Autumn, and then they may be us'd with Success the next Spring.

When you have procur'd such a Bit of *Root* well fitted for the purpose, Care must be taken that it be always a little bigger than the *Branch*, that the *Callosity* may the better get over it. This sometimes proceeds from the *Branch* grafted upon the *Root*, and often both their *Juices* concur to the common Union, particularly when the *Trunk* and the *Root* are not of the same kind of *Tree*, as appears from Experiments. When you have procur'd *Branches* and *Roots*, disposed of after such a manner, an Incision must be pitched upon, there being several sorts, as appears by the Table, *viz.* the Imperial one, that of the Count, and that of the Gentleman; every one is good for Practice; but one is fit for this sort of Operation, and another for that; but Experience will teach you better than any Discourse. For the big *Trunks* I made use of the Imperial Incision, or of those of the Counts or Gentleman, especially the last, the making of which the Figure hereto joined plainly shews; but for small *Buds*, the common or small Incision is sufficient; the common one is made as in the usual way of Grafting, but so as the Cut be neither too wide nor too deep in the *Root*; then the *Trunk* is cut on both sides, in the Form of a broad but short Cork or Stopple; for if it be too long, the Cut in the *Root* must likewise be long and deep, which makes the Wound the larger, and consequently 'tis the longer before it be healed. As to big *Trunks*, there is occasion for a Pair of Compasses or wooden Rule in this Operation; and to that end I caused one of a new Invention to be made, which may be serviceable upon all Occasions, as I shall demonstrate when I speak of the Use of the Tools or Instruments. But when big *Trunks* are to be grafted with the Gentleman's Incision which is the best for them, the *Trunk* must be placed on a Bench fitted for Incisions, lined on the Inside; and on one side a long Cut must be made with the Knife, such a one as the first Cut of a Pen, but some-

somewhat longer; next, such another Incision must be made on the top of the *Root*, so as to make a Counter-cut; then one must be set on the other; but Care must be taken that one Cut be not longer than the other, which will be easily adjusted, by applying the Forester's Compasses; when those two Pieces exactly fit one another, they must be tied with a Fillet about the Middle, that they may not be disjointed. Lastly, the *Mummy* must be warmed, and the Cut done over with it. But because many People not knowing how to manage the Fire, very often burn the *Trunks*, which is the Cause of their Work's miscarrying, I therefore contrived the above-mentioned soft *Mummy*, and cutting some flat, long and narrow Pieces of it, such as the Cuts required, after having a little warm'd them at the Fire, I apply'd them on both sides of the Cuts; then I tied them up with *Bark*; and that neither Wind nor other Violence might shake off the *Ligature*, I fasten'd two Sticks to it, and so put them under Ground, taking Care that the Cuts should be always horizontal to the Ground. Lastly, I got the Earth beaten down pretty hard round about them, and so there ensued the Union of those *Branches* one with the other. I used the little *Branches* and *Trunks* as the big ones, and always supported them with two little forked Sticks, somewhat large at the Top, and small at the Bottom, proportionably to the Bigness of the *Branch* or *Trunk*, as will better appear by the Figure, than by any Description here. It has been said already how both the dry and soft *Mummy* is to be prepared; and it will be seen by the Figure how the dry *Mummy* may be made up in little Rolls.

It is further to be observ'd what Time is fittest for this Work. I find there is not a better Season to graff the big *Branches* and *Trunks*, than the Months of *September*, *October* and *November*; and when the Winter has not been very hard, it may be also done in *February*, *March* and *April*; but then there are some small Inconveniencies to overcome. Those who in Summer-

time will busy themselves about things of this nature, must guard their Work from the heat of the Sun; but though the *Branches* should lose most of their *Leaves*, 'twould be of little Consequence, because they will put forth new ones a few Weeks after.

But if such a thing should happen, that *Roots* of the same *Tree* as the *Branches* you have, could not be got, then use must be made of others that come the nighest to the Nature of them. This occasions a *Query*, viz. Whether there be such a thing as a Transmutation of *Vegetables*, *Trees*, and *Shrubs*, that is, whether they may be turn'd one into the other? Such a *Query* seems ridiculous to many People; and they look upon such a Metamorphosis as an impossible thing, especially those who ascribe to *Trees* an occult substantial Form, which is a superelementary, or an immaterial Being; but my supposing a material one in them will make it an easy matter for me to prove the Possibility of such a change. I'll not keep my Reader long upon this Subject, but only say,

1. The *Soul* of *Trees* is material, therefore it is subject to Alteration.

2. The *Vegetative Soul* is common to all *Trees* and *Shrubs*, and the difference is not in the Nature of the *Soul* itself, but only in the *Contexture*, whereby one is distinguish'd from the other.

3. The Body or Substance of the *Trunk* or *Root*, together with the *Vital Juices*, admit of no Difference as to their Nature, but only as to some Accidents, that distinguish them. I could instance a great many strange Transmutations, but I'll leave 'em for another time. At present I shall only appeal to early Experience, and to some late Discoveries; for who is a Stranger to what *Palladius*, *Lib. 3. cap. 17.* and *Constantine IV.* in the 10th Book of his *Agriculture*, Chap. 38. say, viz. that *Pig-Trees* may be grafted upon *Almond* and *Maple-Trees*; *Winterberries* upon *Chestnuts* and *Beeches*; *Pears* upon *Almonds* and

Pom-

Pomgranats; Lemons and Laurels upon Apples, Plumbs, Walnuts, and Hawthorns; Pomgranats and Peaches upon Willows; Almonds, Plumbs, and Laurels upon Beeches; Lemons upon Palms, or young Cypresses; Olive-Branched upon Vine Stocks; Peaches, also upon Vine, &c. And indeed Men of Judgment have long ago attempted those rare Metamorphoses, for which Posterity is for ever indebted to them, as having through their Curiosity open'd a way for others.

If such a thing may, according to my *Hypothesis*, be done as to *Trunks*, much more may it be done as to *Roots*. But then use must be made only of such *Roots* as agree with one another; and they must be grafted on *Trunks*, with the help of *Fire* and *Mummy*, which will produce the most curious Effects. I gathered out of the *Woods* above Four-score sorts of *Roots*, both of *Trees* and *Shrubs*, whose Structure having narrowly examined, I have already found out those that may be happily joined together. I'll say nothing of it here, but reserve it for the Second Part of this Work, where I'll enquire further into this Matter, being resolv'd myself to work upon all Occasions: For in this First Part, I speak of my Project chiefly by way of Speculation, but with design of explaining myself more clearly upon the Practice hereafter; the rather, since this matter is now so very well known to every body, as to make me less cautious of working in a more publick manner: I shall therefore employ People under me, and faithfully impart my Discoveries. Before I dismiss this Proposition, I shall say something more about the *Tools*; I have divided them into such as are of General Use, and such as are peculiar to *Forests* and *Gardens*. Those of General Use are so common, there is nothing to be said of them; they may be seen to satiety in the Cut. I give some the Name of *Forest Tools*, because they are chiefly requisite for *Trunks* and *Roots* in the *Woods*: Such are these, a *Forest-Knife*, a lin'd *Bench* for *Incision* or *Cutting*, a pair of *Forester's Compasses*, a Measure of
some

some Feet in length, a *Bench* for *Roots*, &c. Among the *Garden Tools* are, the *Root* or *Graffing-Chizel*, all sorts of *Incision-Knives* and *Graffing-Chizels*, a hollow *Wimble*, a *Splitting-Knife*, &c. I had a mind to get my *Graffing-Pouch* engrav'd, it being very curious and neat, but time would not allow it to be done. However, Gentlemen who have an Interest in it, may depend upon me that I shall not deprive them on't, when I shall be once satisfy'd that they are pleased with this my Beginning; and when my Antagonists shall have ceas'd troubling me. There has lately appear'd a new one named Mr. *Râthel*, Superintendant at *Newstad* upon *Aysch*, who in a very unchristian manner misrepresents my whole Scheme; (but it seems 'tis his way, for he misrepresents his own Name by transposing the Letters) he is positive I formerly writ about a multiplying *Menstruum* or *Dissolvent*, which yet I never thought of: Whereas he boasts of having invented a certain *Pea Dissolvent*, by the means of which he hopes, with God's Blessing, in a very little while to bring *Trees* to a full growth: But time will soon shew what Noise he will make in the World with his *Peas*, especially when he puts 'em into a Bladder. Mean while, those who think themselves concerned in't, may take my word once more, that this First Part shall (God willing) be certainly follow'd by a Second.

My Graffing-Pouch contains the following Tools.

First, The *Pouch* or *Case* which incloses the *Tools*, and is much like a Surgeon's Case, wherein he keeps his Instruments; mine are the following, viz. 1. A Perpetual Ivory Almanack; on one side of which is always a Month Engraven, but the other side is smooth, in order to write any thing upon it. 2. A small *Pen* to write with, of a particular make. 3. A *Root Bodkin* or *Chizel* of a late Invention. 4. A *Graffing-Bodkin* very fit for the purpose. 5. A *Graffing-Knife* fit for nothing else. 6. Several *Knives* for *Incision*. 7. A hollow *Wimble*. 8. A *Knife*

Knife only for *Splitting*. 9. A *Grafting-Chizel*. 10. A small *Hammer*. 11. Some other *Chizels*. 12. An *Ivory Spindle*, round which are roled small thin *Fillets* to be made use of instead of *Bark*. 13. Another, upon which is the soft *Mummy*. 14. A little *Ivory Knife*. 15. A little *Glass Knife* very fit for *Grafting*. 16. A little *Gardener's Saw*; of all which *Tools* we will hereafter give a short *Explanation*.

PROPOSITION V.

About Universal Multiplication, as it may be practised upon big Trees, by a particular manner of Grafting the Roots.

It is certain several skillfull *Lovers of Gardens* have absolutely denied there ever could be an entire *Union* effected between a *Root* and a *Branch*; but they never told us the *Reason* why such a thing cannot be artificially done, nor where the *Impossibility* on't lies; but I hope they will explain themselves one time or other. I don't know why *Nature* should not allow of such an *Operation* as is grounded upon *Nature*; every body knows that the *Trunk* is placed upon the *Root*, and it is clear that they are internally united together. It is also true, that when such an *Union* is wrought by *Art*, the *Callosity* never fails to come out; and it is undeniable that this *Callosity* joins the *Trunk* and the *Root* together. It is moreover certain, that these two *Parts*, viz. *Shoots* and *Branches*, have their growth from thence; but what would come from a *Root* grafted upon a *Root*, I own I don't know as yet; however I'll make a *Proposal* concerning my *Art of Grafting Roots*, and I don't question but *Experience* will justify it.

This may be done in the following manner: The *Root* (of an *Apple-Tree* for Example) being well cleaned, is laid horizontally upon the *Ground*, as you see *Fig. 1.* then you cut off from several *Apple-Trees*, some big and some small *Branches*, and Graft them by *Art* upon the *Root*; which conveniently to do, I contrived several sorts of *Incisions*, both in the *Root* and *Branch*,

it not being always possible to do it the same way: I'll explain this in few Words.

One way is, only to make an *Incision* in the *Root* with a two-edged sharp-pointed *Knife*, but not so far as the Center, and then the Cut may be made bigger if occasion be; but when the same is to be done to a big *Root*, then a bigger Tool is to be made use of, either a *Graffing-Chizel*, or other such like, as (*k*) shews it.

When therefore you have a mind to Graff a *Branch* upon it, you must make such an *Incision* as is used in the common way of *Graffing*, and as (*A*) represents; you must take off the out-side *Bark* on both sides, and at the place where the *Trunk* is to be upon the *Root*, a little of the *Rind* is to be cut off, that it may the better fit the *Root* and be closer joined to it, as you see at (*P*.)

But this *Incision* not being proper for all occasions, I try'd one day the following Experiment: I made a square Cut as deep as the third part of the *Root*, as (*I*) shews you; then taking my *Branch*, and cutting it broad on one side, tho' not so far as the Heart on't, I took off a little of the *Rind* from the top of the *Root* where the *Branch* was to be, and I set the *Branch* on it, as you see at (*O*); but this Method not proving so very good, I try'd the third, denoted by (*H*), which is really very good, and pretty easy; this is the way I went about it: I made a streight *Incision* into the *Root*, and after that a little Notch, which I cut streight along as far as was occasion, then I sharpened my *Branch* on both sides, as in the common way of *Graffing*, so that the interior part grew smaller and smaller, and the exterior bigger and bigger towards the Point, and having taken off the outside *Rind*, I laid it upon the *Root*, as (*N*) shews it, but I could not every where make the same *Incision*, and this made me use the Notching-way, as you see at (*G*) which was executed thus. I made a streight *Incision* down into the *Root*, and then
on

on both sides a Notch as wide as the *Branch* was big, such as the Figure represents it; in the *Branch* I made a Notch-like Incision, as (*D.*) shews it, and so join'd the *Branch* with the *Root*, as is seen at (*M.*)

But when I went about graffing upon the biggest End of the *Root*, none of those Incisions would do; wherefore I took a hollow Wimble, and bored a round Hole in the *Root* agreeably to (*F.*); then I made a round Stopple of the *Branch*, and thrust it into the *Root*, as in Fig. I.

The Incision being made, I proceeded to the *Ligature* with the soft *Mummy* spoken of before, which I spread as a Plaister, and laid it across, as shews (*I*); and that Wind or other Accidents might do no Mischief, I join'd Sticks to it, as (*M*) shews it. When both the small *Branches* were treated as before, the *Root* was laid down lengthwise, so as not to be deeper under Ground than the Breadth of one's Hand; the Hole was filled with good Earth, well beaten down, and the rest left to Nature's Care. When in process of time the *Trunks* are united to the *Root*, they may be parted from one another in due Season, and each part of the *Root* being done over on both sides with prepared Wax, they may be transplanted where-ever you please, and you may depend upon very good Success. You may deal by large *Roots* as by small ones, and those of foreign *Trees*. For Instance, when you have a mind to graff *Branches* upon *Roots* of such little *Lemmon-trees* as are in Pots; the *Root* being taken up, a fine Sucker must be chosen, and an Incision made in it; then the *Branch* is to be put to it according to Art, after it is well done over with the most noble prepared *Wax*: there are some Charges, it is true, but the Effect is wonderful, and the Cost is plentifully made good by a perfect Union.

The most noble *Wax* for the *Graffs* is made thus: Take an Ounce of *Gum-copal*, and beat it well to Powder; then a quarter of a Pound of *Venice-Turpentine*, and melt these two together;

ther; when the *Gum-copal* is dissolv'd in them, put to it an Ounce and a half of common *Wax*; this being also melted, let them evaporate together over the Fire, till most of the *Turpentine* be gone; then you may roll it up in little Bits, or else make it in form of a Plaister; if you will add *Aloes*, *Mastick*, and other such like Drugs, it will be the better for it. Whereas a vegetable *Balm* has been often spoken of, I think it my Duty to give here both its Composition and Use.

Therefore in order to make it, take a quarter of a Pound of sweet *Almond-Oyl*, and only dissolve in it half an Ounce of prepar'd *Turpentine*, as it is sold at the Apothecaries. This *Balm* is very good, chiefly for big *Trunks*, especially when they lie too long in the Air, it not being always possible to prepare them as quick as should be; then such Places of those *Trunks* as have past under the *Saw*, are to be daub'd over with that *Balm* but slightly, only to keep 'em from suffering by the Air. I could very well have mentioned four other Methods, which are very uncommon; and one of which is so particular, as infallibly to preserve *Branches*, *Shoots* and *Trunks*, if they be but done over with prepared *Wax* as Art requires. But because I hasten towards a Conclusion, I shall acquaint the Curious in my second Part with what is omitted here upon this Subject; for I have still somewhat particular to say about the *Vine*, in Obedience to the Command of her Majesty the Queen of *Poland*, and Electress of *Saxony*, who, on the thirteenth of *December*, in the Year 1712, publish'd an Order, for all Owners of *Vineyards*, in the Electorate of *Saxony*, to make it their Business to improve and multiply them. I have also something to say about the Art of encreasing *Fruits* to such a Bigness as Nature can allow: For tho' it would be ridiculous to think a *Peach* could grow as big as a Bomb, yet it is not impossible to bring one already as big as the Fist, to the Bigness of a little Child's Head; or *Muscadel Pears* to the Bigness of those of the Fore-season; as also how something
may

may be perform'd by the Mixture of Earths contrary to one another. It is certain, that by the Knowledge of Colours, *black*, *yellow*, and *Sky* colour'd *Pinks* may be produced, and I shall discourse of it at large. I'll only give here some Hints of my Thoughts as a rough Sketch: Take *Gall-nuts*, mix'd with something made up of vitriolous Parts, and they will produce a *black Pink*. Take *Oak-wood*, with a quantity of vitriolous Earth, and try what will come out of it: But all this will be found more at large in the promised Part. In the last Chapter I shall consider with more Exactness the Experiments I made, together with their Usefulness.

P L A T E IX.

The true Basis whereon the Universal Multiplication of Vegetables is grounded.

(a. b.) *An Axiom of the famous Philosopher Hermes Trifmegistus: Quod est superius, est sicut id quod est inferius, &c. it is a constant and certain Truth, that what is above, is as what is below.*

(c. d) *The Words of the same Philosopher contain'd in another wise Maxim; Quod est inferius, est sicut id quod est superius; it is a constant and certain Truth, that what is below, is as what is above; or, if you will, without imagining a mystick Sense, this may be applied to Trees, as tho' the Words were thus:*

Branches get Roots and become Trees; as also Trunks become Roots, and Roots produce new Branches.

(e.) *Is a Piece cut off from a Branch, and covered top and bottom with prepar'd Wax, which took Root at the bottom, and brought forth Branches at the top.*

(f.) *Are Roots which are chiefly seen near a Branch, and have a more speedy Growth than those whose Beginnings are seen upon the Bark.*

(g. g.) *How*

(g. g.) *How the small end of a Branch must be well done over with prepar'd Wax, in order to graffing.*

(h.) *A Bit of a Root cut off, which being done over top and bottom with prepar'd Wax, began again to shoot, and produc'd the finest Branches in the World.*

(i.) *With what Caution Fire and Mummy are to be used.*

(k.) *A large Bit of the Root of an Apple-tree a Foot and half long, which, in three Months, shot a Root that grew to the Length of an Ell, and a great many Branches on the side.*

(l.) *The big Trunk grown in height.*

(m.) *The side Branches that shot out of the large Trunk.*

(n.) *How the prepar'd Wax is to be applied.*

P L A T E X.

How great Numbers of Trees are produced either from the big Roots cut off, as from the smallest Bits of the same.

(a. a. a.) *A long and big Root cut off from a Pear-tree, from the Pores of which shot a great many Twigs and little Branches of several Bignesses.*

(b. b.) *A Bit of a Peach-tree Root, which shot new Roots under Ground, and a large Trunk above it.*

(c. c. c.) *The Root of a wild Quince-tree, which also shot new Roots, and out of Ground a quantity of Branches on one side.*

(d. d. d.) *A Vine-Root done up with Mummy according to Art, which not only shot Root a-new, but also germinated to Admiration.*

(e. e.) *Are Lemmon-tree Roots well dress'd at top and bottom, with the best Mummy; they shot new Roots in several Places; and also all sorts of Buds; some shot at the top; others that had been pretty backwards shot at last at the bottom, and the Shoots got also Roots.*

(f. f.) *Little*

(f. f.) *Little Bits of Pomegranate-trees, which likewise brought forth both Roots and Branches.*

(g. g. g.) *The Use of the dry Mummy.*

(h.) *Is the dry Mummy for Forest Trees; how it is melted up on a Chafing-dish; and how with a moderate Warmth it is made use of to heal what has been damaged.*

(i. i. i. i.) *The opened Pores whence Buds come forth.*

(k.) *A particular sort of Bench for Roots.*

(l.) *The Board high in the middle, and hollow within, as may be seen at (m).*

(n.) *Another little Board fasten'd to the former with a Hinge, together with the Notches to be made in it; as also the Springs to be set within, that it may open of it self.*

(o.) *The Foot-board to which the upper Rope is fasten'd, which runs through the two Boards from the top thither. When the Foot is set upon it, the Engine shuts it self at the top; but when the Foot is off, it opens by the Means of the Steel-springs that are within it.*

P L A T E XI.

How by means of Fire and Mummy, Leaves, Twigs, Buds and Branches may be turned into Shrubs and Trees, by planting them in the Ground.

Fig. I. *This has a Relation to Multiplication by Leaves, some of which have got Buds at the bottom, and some not. Those of the former sort being done up with Mummy, and laid under Ground in the manner here represented, some of them lose their Substance; others fall off of themselves; and the Buds shoot, as was mentioned before, when we treated of the rare Experiment upon the Lemmon-tree Leaf.*

Fig. II. *Is a long Pear-tree Branch that was cut into several Pieces.*

(a. b.) *Is a Piece done up on both sides with the prepar'd Wax for Forest Trees: There is a younger Branch seen upon it, which*
if

if employed for Multiplication, may be cut to pieces, as Art teaches, and c. d. shew.

(k. k.) *A Notch in a piece of Branch, under which there was Cotton put, which had been before dipp'd in the prepared Wax, and then covered with Mummy, from which came out a sort of Callosity and a Root.*

(l.) *How Mummy is employed for covering any thing.*

Fig. III. *A long and high Branch fasten'd to a Bit of Branch that has two Parts, (e) and (f), which, being done up with Mummy, takes Root near the Knots; and how both the Ligature and Props are made.*

Fig. IV. *How the Leaves of the same great Branch were half cut off, and fell of themselves, which was a certain Sign that it would take Root.*

Fig. V. *How the same Branch, after having soon after shed all its Leaves, appear'd as if it was dying.*

Fig. VI. *The same Branch again, which, a few Weeks after, began to shoot out on every side.*

Fig. VII. *How the same Branch, after some Months, appeared full of Vigour, and in as good a Condition as at the Beginning.*

(g. h. i.) *All necessary Things, such as dry Mummy prepar'd for long Pieces; as also the Tools, Bas, and such like Things.*

Fig. VIII. *How the Multiplication is perform'd by burying under Ground such Branches as have one, two, or three Knots, chiefly when they are so laid in the Earth, as to let the Extremity of the Trunk, which is done up with Mummy, appear a little above Ground.*

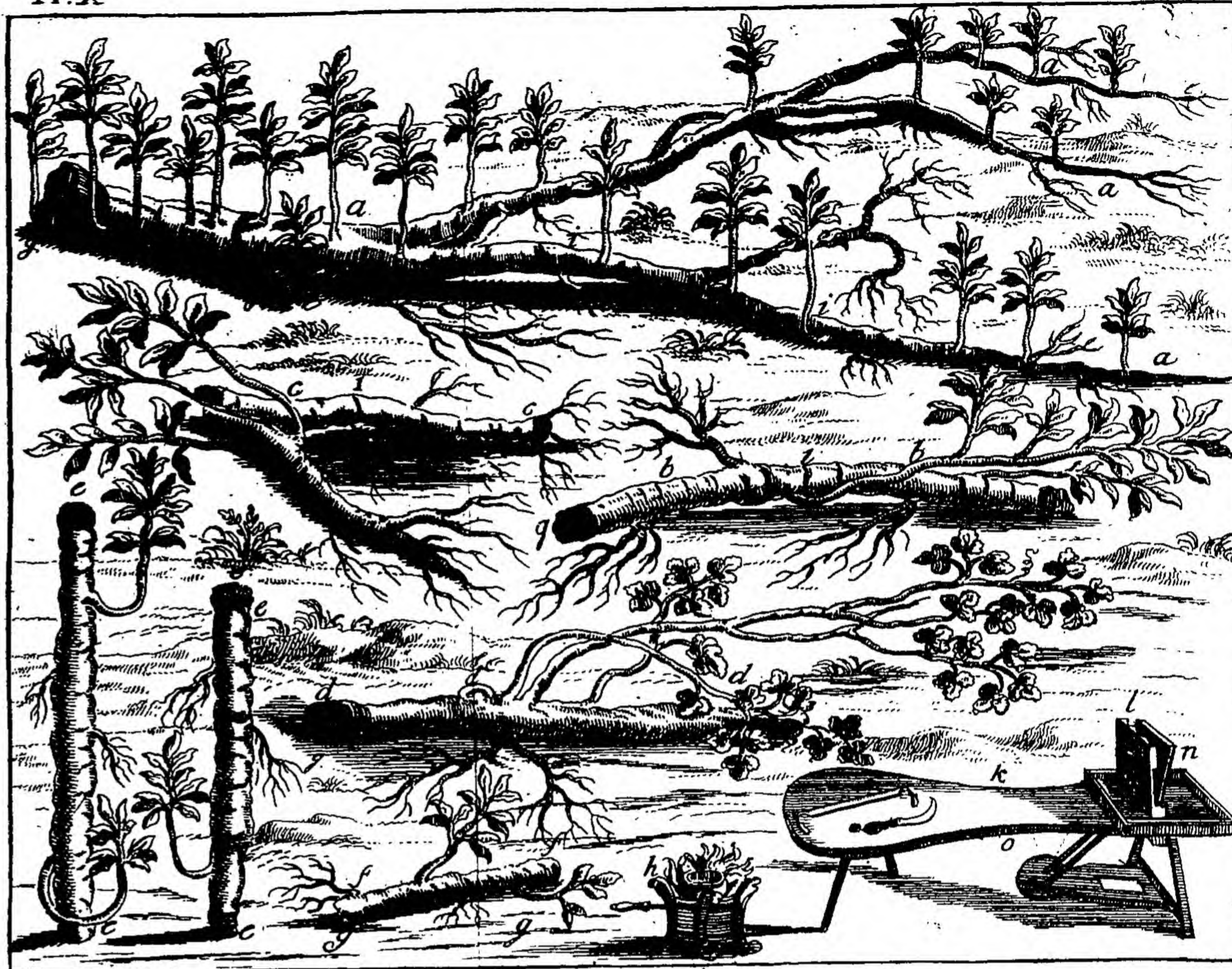
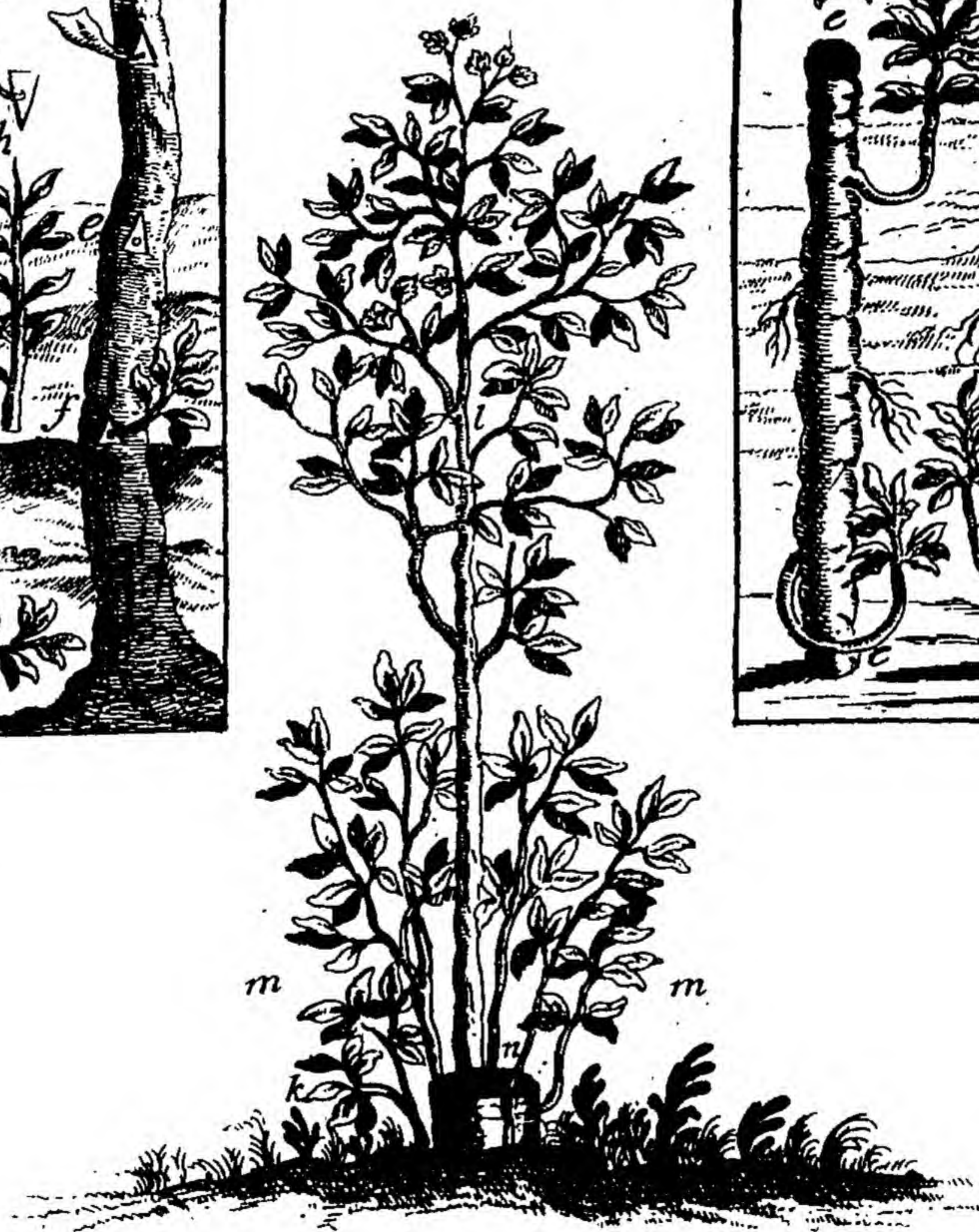
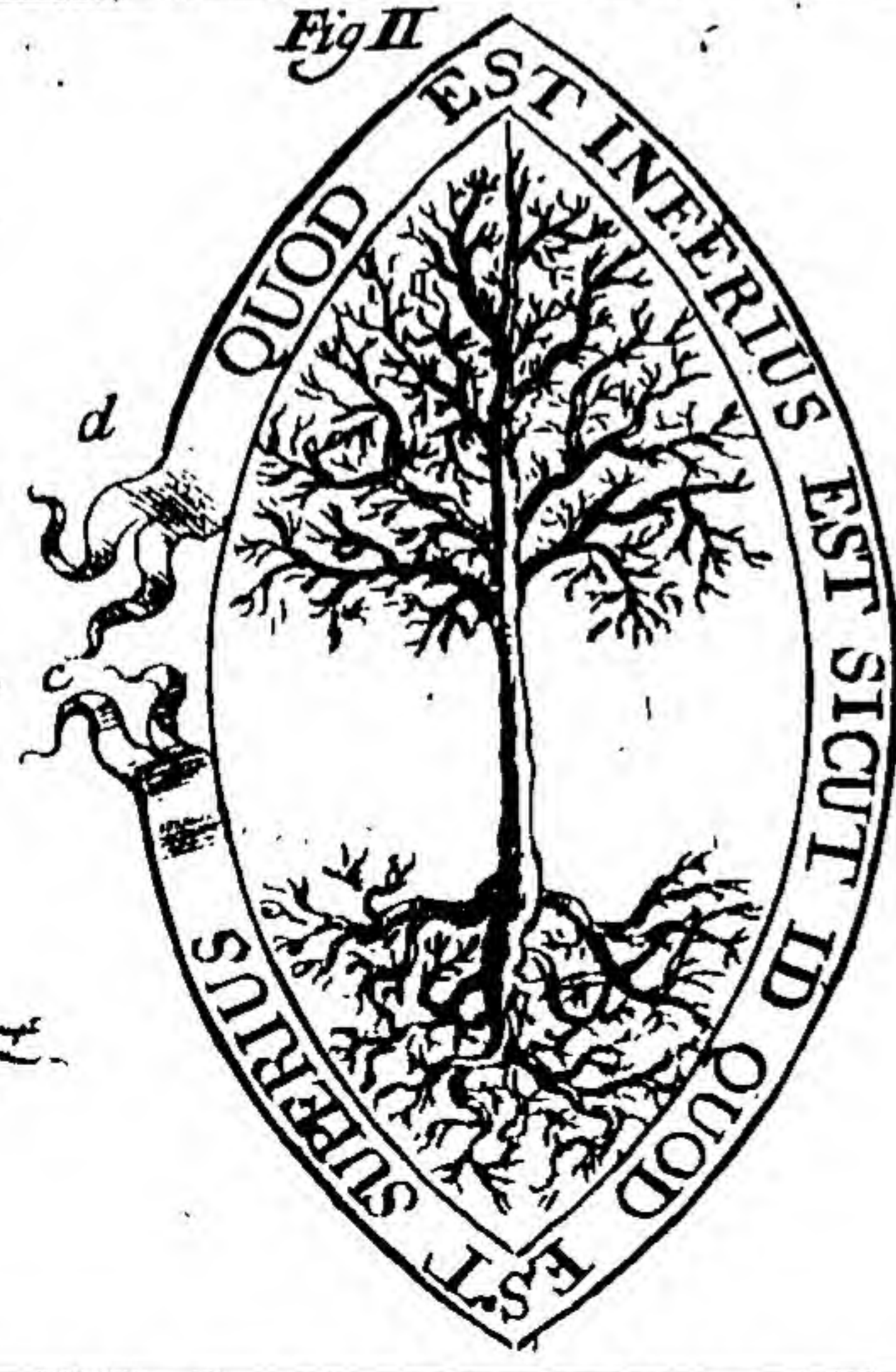
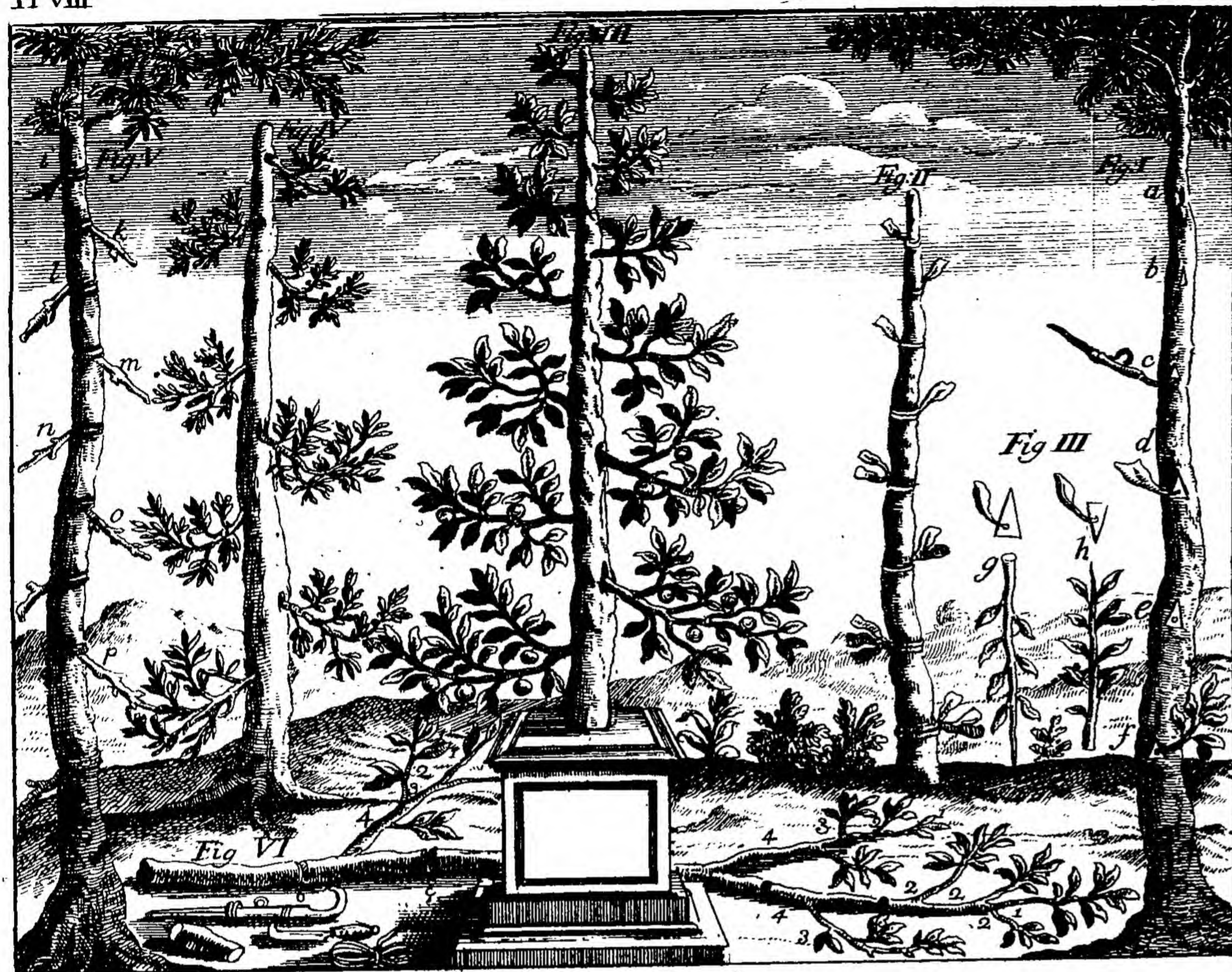
P L A T E XII.

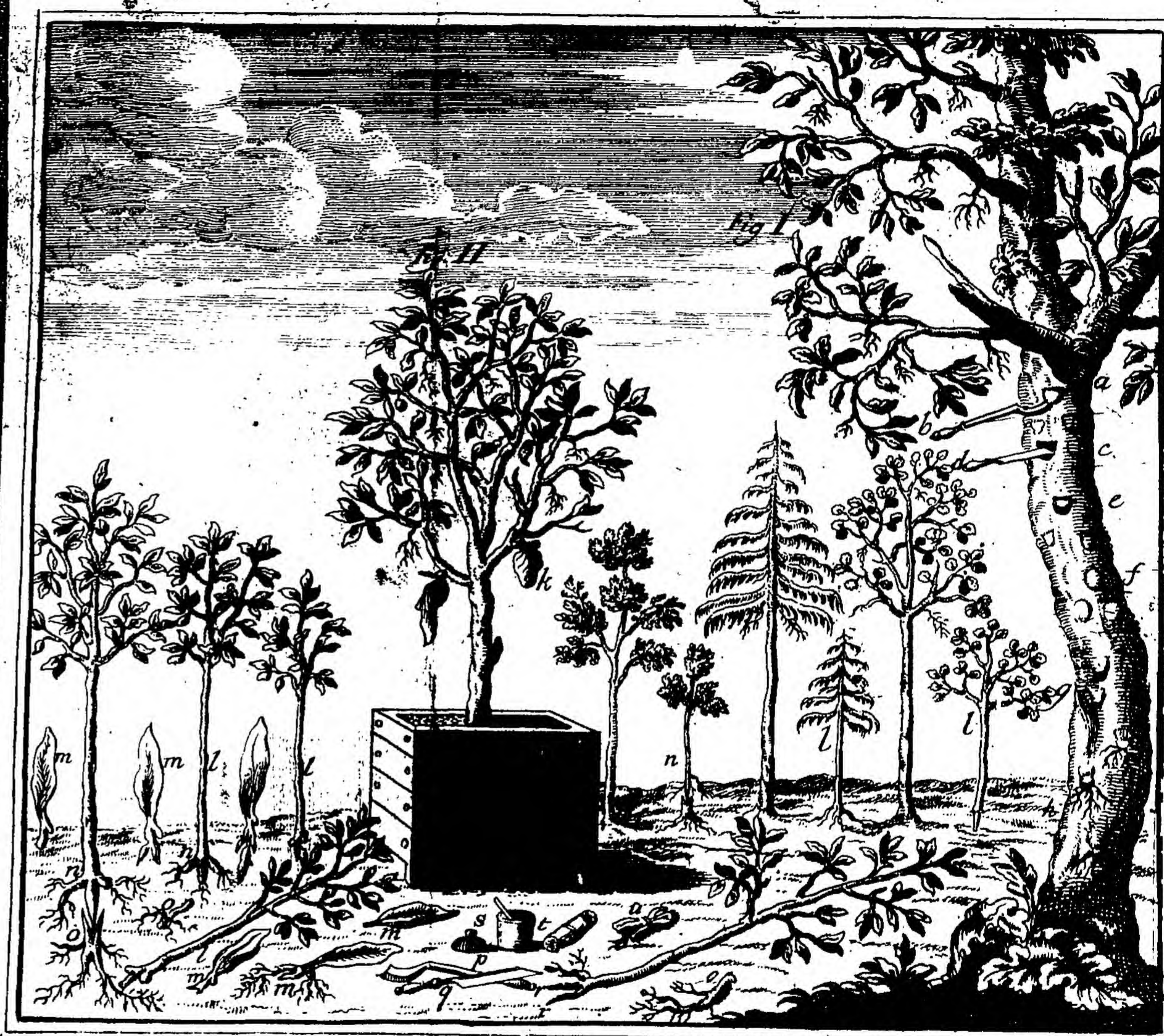
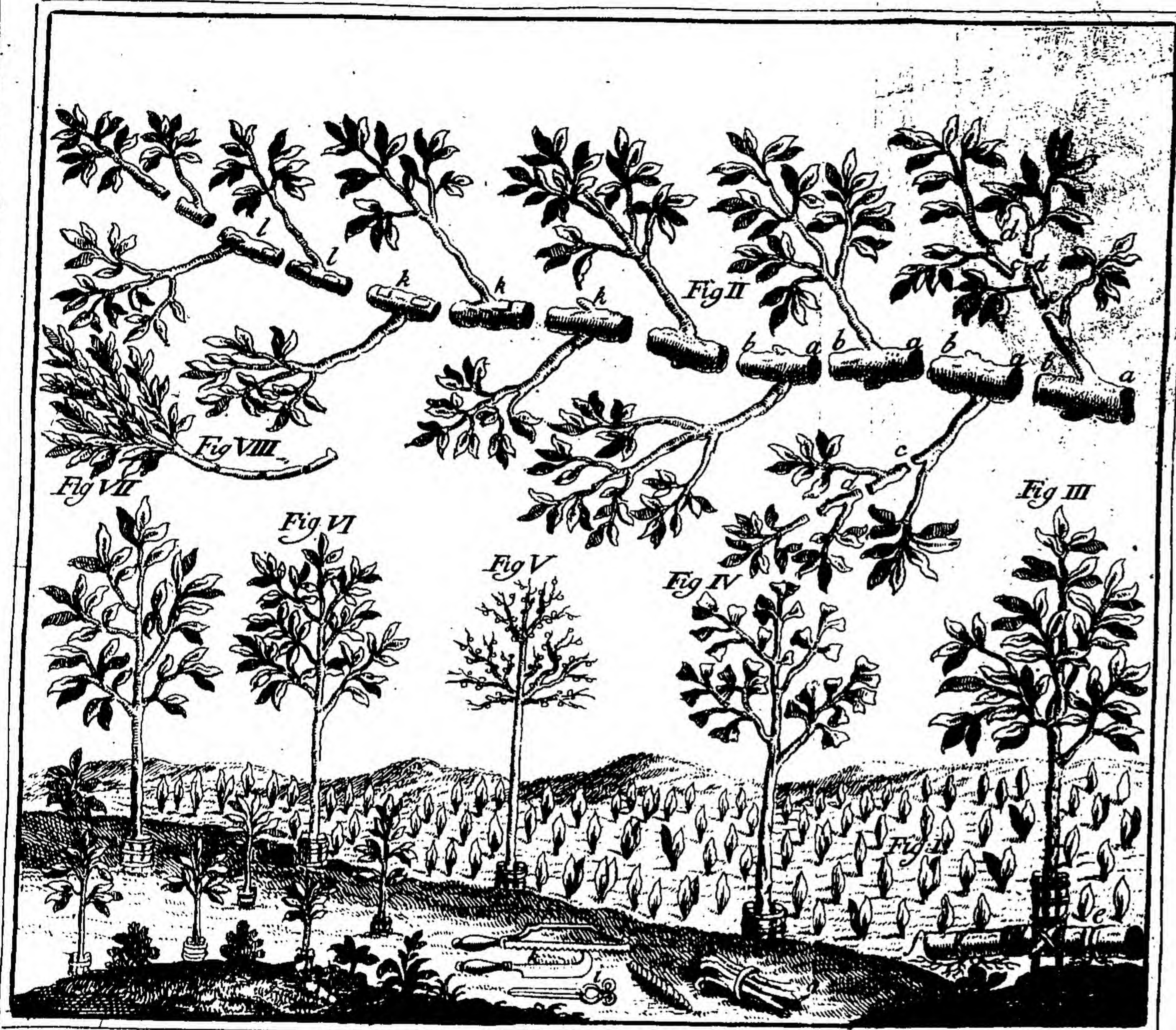
Of the Universal Multiplication, which is perform'd with the Graffing-Chizel.

Fig. I. *The Use of the Graffing-Chizel.*

(a.) *How the Chizel is to be set.*

(b.) *How*





(b.) *How it must be driven into the Bark to the Wood with a Hammer.*

(c.) *How the loosen'd Bark, together with the Wood may be cut off, with the little crooked Knife, that so the Callosity may grow out the more easily.*

(d.) *A round Root-knife to make the Incision withal.*

(e.) *How Cotton, or something else, is to be put under the loosened Bark, to keep it from being squeezed.*

(f.) *How the Incision is to be covered with prepar'd Wax.*

(g.) *How that Wax opens it self by little and little; and how on the Surface of the Callosity the Beginnings of the Roots are seen.*

(h.) *How the so much wished-for Root at last visibly comes out of that first Substance, either on the upper Part of the Tree, or under Ground.*

Fig. II. *A fine Sight of an Orange-tree, which shews its Flowers, Fruits, hidden Roots, and lastly perfect Roots on the upper Part of the Tree: How with Oyl-cloth-Bags or Tin-boxes the Root may at the same time be made grow so, as to hang down the Tree, as (k.) shews it.*

(l. l.) *All sorts of Branches taken from several sorts of Trees, on some of which the Callosity appear'd at two or three Incisions, and which were all prepar'd to take Root under Ground; tho' some had already shot forth Roots on the Trees, and wanted nothing but to be planted.*

(m. m. m.) *How Leaves, on which the Callosity appears, by means of the Graffing-Chizel, may be brought to a full Growth by the Art before-mentioned.*

(n. n n.) *How the Root opens it self a Passage through that Callosity.*

(o. o. o.) *How Putrifaction often appears at the bottom of the Leaves and Branches which are cut and set in the Ground, on which occasion 'tis fit another Root should be applied to them by*

means of the prepar'd Wax, that so the Trunk may receive its Nourishment till the Callosity be brought to Perfection.

(p. q. r. s. t.) Things requisite for such an Operation.

P L A T E XIII.

The Manner of grafting Roots, used with respect to great Branches both in Gardens and Forests, which, if perform'd according to Art, with the help of Fire and Mummy, makes 'em improve, shoot, and come to a perfect Growth.

(A.A.) The general Incision, which however is not to be practis'd upon great Trees; the former (A.) shewing the Incision, and the latter how the Branch is laid upon, and in it.

(B.B.) A sort of Incision lately found out, going by the Name of the Imperial Incision, which, if cautiously used, is fittest for the great Branches of Forest-Trees, and is soon done. One (B.) shews the Incision, and the other the placing of the Branch.

(C.C.) Represent the Counts Incision, invented by a Nobleman of great Distinction, which may be practis'd on large Stocks, provided it be done carefully. Here also may be seen how a just Union is made.

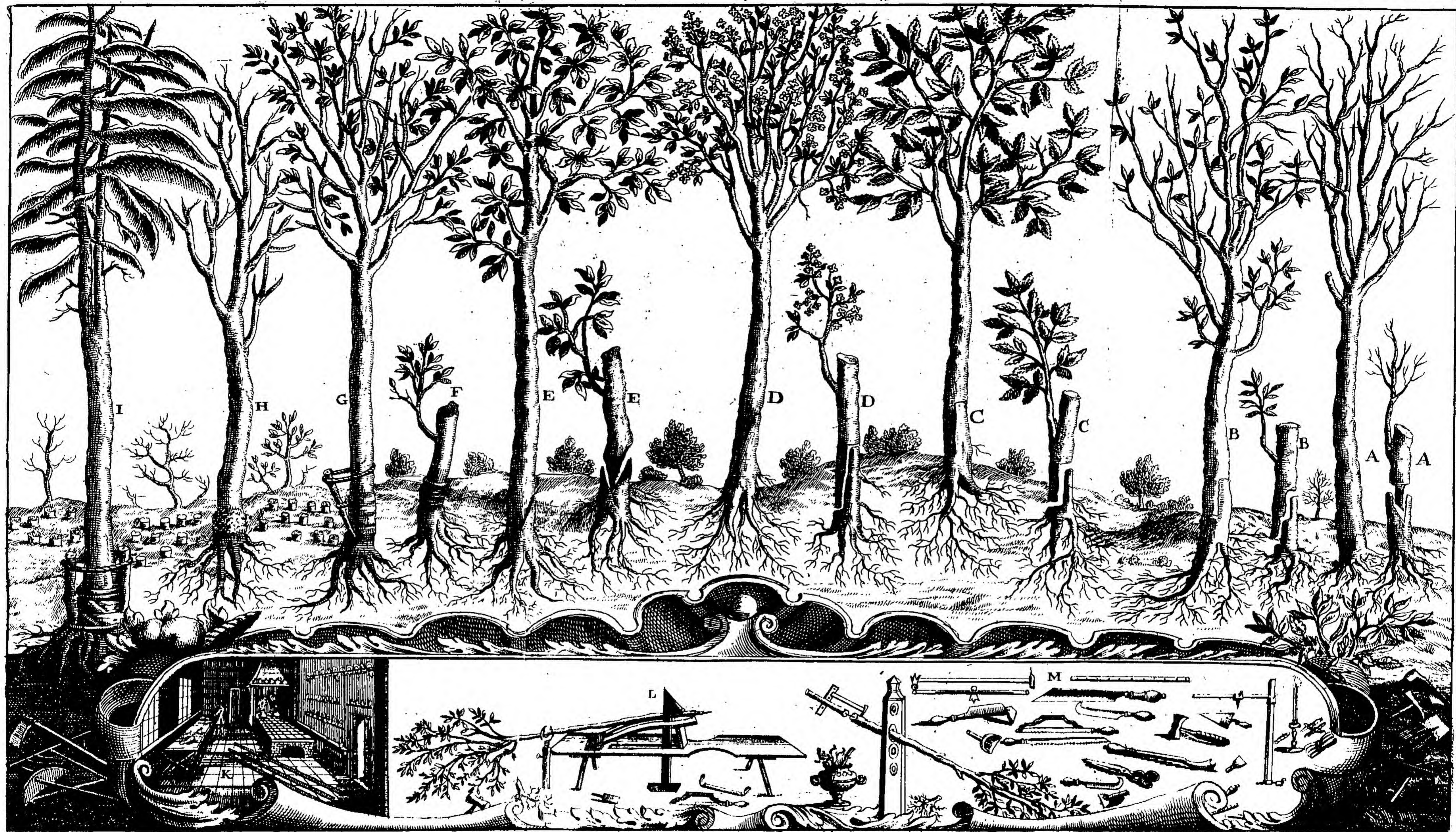
(D.D.) Is the Gentleman's Incision, invented by a Gentleman of great Curiosity in Gardening. It is plain, but nevertheless very good, especially for large Branches of Forest and Garden Trees.

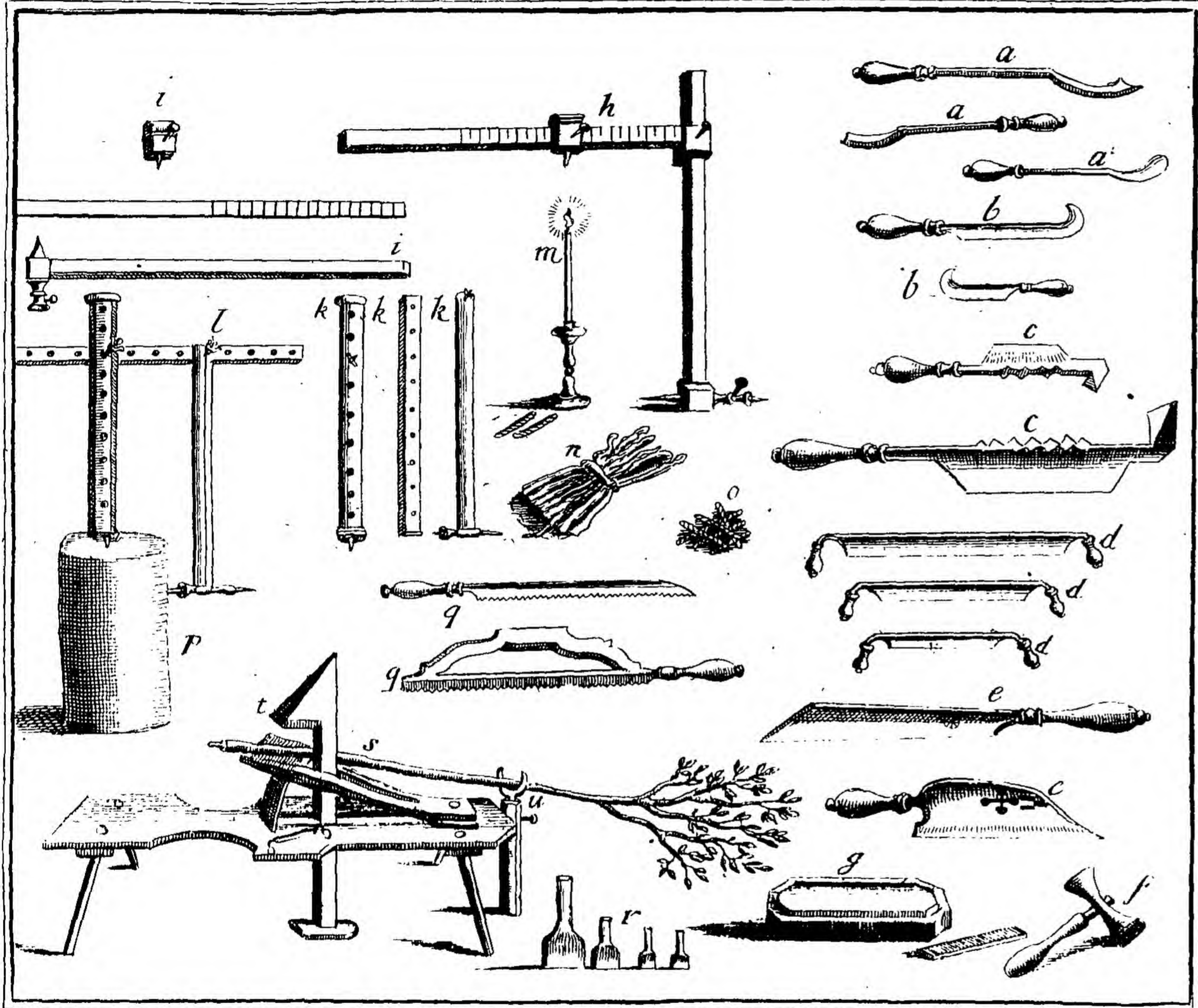
(E.E.) The Entail Incision, proper both for large and small Stocks; but Care must be taken that the Root be always bigger than the grafted Stock.

(F.) How these two Parts are tied together, which may be done either before or after covering 'em with Mummy.

(G.) Manner of putting on the Mummy, and making afterwards the Ligature, which is secur'd with a Stick till the Pickets are ready.

(H.) Shews





(H.) *Shews the Mummy, and how they are tied together.*

(I.) *The Ligature and the little Pickets fix'd to it; and how they are planted.*

(K.) *Represents the making the Mummy up into little Rolls, which requires a great deal of Circumspection.*

(L.) *The Bench fitted up for working, which we shall speak of hereafter.*

(M.) *All sorts of Garden and Forest Instruments, explain'd more at large in another Figure.*

P L A T E XIV.

Which explains the Wooden and other Tools, which are necessary for the several Operations.

(a. a. a.) *Several Chizels or Instruments proper for grafting the Root.*

(b. b.) *Several large and small Lopping-bills.*

(c. c.) *Large and small Knives, which are of use as well in the Woods as Gardens.*

(d. d. d.) *Several large Knives with broad and thin Blades, necessary for all kinds of Work.*

(e. e.) *Large Forest-Knives to cut and hew, among which there is one of Steel, proper for all Operations.*

(f.) *Is a Mallet broad at both ends; but one of them is a little more rounding than t'other; good for all Uses.*

(g.) *Represents a Grindstone to sharpen the Tools, which afterwards must be well wiped, and kept very clean, that they may not spoil the Graffs.*

(h.) *The Iron Forest-Compasses newly invented; and how they are mounted.*

(i. i. i.) *The same Compasses taken to pieces, being compos'd of three pieces, to wit, two long ones with a Scale.*

(k.) *The first Invention of the wooden Forest-Compasses representing them as dismounted.*

(l.) *Shews them mounted, and (p.) their Use, with the Point in the Circumference; as also the Case for the Pencil, or other things.*

(m.) *Is the Fire to melt the Mummy, by which we mean either that of the Candle or Coals.*

(n.) *The Bals which is necessary on all Occasions.*

(o.o.) *Is the dry Mummy, and how little Rolls are made of it.*

(q.q.) *All manner of Hand-Saws, one of which is made so as it may be used like a Knife for cutting or splitting of Wood.*

(r.r.) *Several Iron Chizels, broad and narrow, with long and short Handles.*

(s.) *Represents how a Branch is placed on the Work-bench, in order to be cut as it should be.*

(t.) *Shews the Furniture of the Bench.*

(u.) *Is a Vice fix'd to the Bench. We might have invented several other kinds of Work-benches; but none could be found out better than this; for the more simple it is, the better.*

P L A T E XV.

Which shews a particular Manner of grafting on the Roots which remain on the Trees till they have attain'd their full Growth.

Fig. I. *A large Tree disfurnish'd of one Root, in which appear several Incisions, whereof one may be chosen at Pleasure; as also how the Grafts appear which are inserted.*

(A.) *A large Branch, which is pared at both ends with a Knife, as when one grafts the common way. The chief thing to be consider'd is, that a little of the outward Bark of the Branch must be taken off, that it may unite the more easily with the Cleft.*

(K.) *Shews*

(K.) *Shews the Cleft in the Root cut almost into the middle, in which the Stock is grafted, as (P.) demonstrates.*

(B.) *Is another Incision made breadth-wise in the Stock, after which a square Incision is made in the Root, in proportion to the Branch, as (I.) represents; which then is fix'd to it, as is shewn by (O.)*

(C.) *Represents also an Incision in the Stock, which is made on both sides, on one side of which it terminates in a Point, so that the Bark must be taken away altogether, but on the other side you only take off the lesser Rind, and insert it thus in the Incision made in the Root (H.) as (N.) shews.*

(D.) *Is an Entail Incision, as it is made on one side of the Stock, tho' with double Cuts; (G.) represents how the Counter-Cut is made in the Root, and (M.) shews how to insert the Stock.*

(E.) *Is a Branch which is cut round in proportion to the Incision in the Root, and according to the Circumstance of (F.) One sees its true Figure in (L.)*

(L.) *Shews the Stock dress'd with Liquid Mummy, and how it is tied cross-wise.*

(M.) *Shews how the Pickets are fix'd, to prevent its being shaken by the Wind, and other Inconveniencies.*

Fig. II. *A large Citron-Tree which is extended on the Earth, and on which one may Graff the Branches, Shoots, and Leaves, by all kinds of Incisions, as (R.) represents. The same thing may be practis'd on exotic Trees kept in Cases, according to (S.) And they who will take the pains may do the same on Forest-Trees, as (T.) shews.*

(Q.) *The Tools, such as the hollow Wimble, the Pruning-Knife, the Mallet, the Chizel, and the liquid Mummy used in these Operations.*

C H A P. IV. and Last.

*Of several Experiments, and their great Utility in
GARDENS, Plantations about COUNTRY-SEATS,
and Woods.*

§ I. **S**INCE *Hippocrates, Lib. 1. Aph. 1.* says *Experientia fallax*, Experience is deceitful, I may very well say, *Experimentum fallax*, Experiments are uncertain; yet *Lasus* being ask'd, *Quidnam esset sapientissimum?* he answer'd *Experientia*, Experience. But how could so wise a Man talk in this manner, when daily Tryal taught him that *Experience* was Fallible, Uncertain, and Dangerous? But perhaps he had a mind thereby to acquaint us that *Experience*, to be True and Certain, must be founded on Judgment and Understanding, and that it is no otherwise possible to discern Truth from Falsity, than by proving a thing by true Experiments: And that tho' *Experience* is oftentimes Deceitful, and we sometimes ballance between Truth and Uncertainty, even when our Judgment is put into the Scale, yet we may in some respects distinguish the True from the False, especially if the perfect Masters *Usus & Exercitatio*, Use and Exercise, are added. *Nam Usus est efficacissimus rerum omnium Magister: Quia talibus experimentis, inquit Plinius, optime creditur.* For Use is the best Master in all things, and we must give the most Credit to such *Experiments* as are confirm'd by Use. *Pliny* and *Cicero* express themselves thus: *Usus omnium Magistrorum Præcepta superat*, Use excels the Precepts of all Masters; this *Manilius* agrees to, when he says

*Per varios usus artem Experientia facit
Exemplo monstrante viam.*

Experience

Experience is the Mother of *Art* by various Tryals, Example shewing the way. In short, if we desire a true and infallible Master to direct us to what is True, Certain, and Infallible, 'tis *Ætas* or *Time*. A Poet tells us, *Seris venit usus ab annis*, Time shews us the use of all things. And *Solon* Αἰεὶ πολλὰ διδασκόμεθα, &c. *assidue multa addiscens ad Senium propero*, by continual *Experience* I advance in *Knowledge*.

§ 2. We see also clearly, that our Endeavours are but by piece-meal, and that we produce nothing perfect at once, for all our *Experience* and *Tryals*, our *Judgment*, *Labour*, *Trouble* and *Exercise*, are nothing in comparison with *Time*, which alone sets things in a true light, and which is not in the Power of Man. This indeed discovers the Verity or Falsity of things, but while we wait for it, we are altogether in the dark, for we often execute a thing according to *Judgment*, and (as we think) according to the *Rules* of *Nature*, till by some unexpected turn she shows us that we are in the wrong, and that she will not be forced: Then we find that we did not begin at a proper time, and that the Fault was in our selves, not in Nature; *Nam humanum est errare*, for it is natural for Man to be deceiv'd; and it is no Shame, but our Duty to acknowledge our Error.

§ 3. As I undertook an universal Propagation of *Plants*, by their *Roots* and *Branches*, and assur'd People that it was founded on good Sense, and approved by several experienced and intelligent Persons in *Gardening*, so a great many Lovers of the said Art have found, that the Success of these *Experiments* answer'd their Expectation, and shew'd 'em the Possibility of the thing; and since the World requires Evidence of the Fact, therefore though it would be more agreeable to me that every one should himself make tryal of it, which would save me a great many Words, I shall briefly publish here something which I can verify by the Letters which I keep by me. The 22d of *May* 1716,
I re-

I received the following Letter, written by a certain Prince with his own Hand.

SIR,

THIS is to acquaint you with the Experiments that have been made in the Methods you propos'd, and the Success they have had. The 20th of March 1716, the Weather being very Cold and Snowy for many Days together, I grafted two Apple-Trees, viz. one of Summer Borsdorp, and the other of large Bak; two Summer Bergamot-Pears and King-Pears, with two Abricot-Trees, one upon a Vine, and the other upon the Root of a Plumb-Tree; a red Peach upon a Quince-Root, another upon a Vine-Root; all these were set at the same time in good Earth. The 27th the Cold and Snow being a little moderated, I planted a-new in good Earth a red Apple-Tree of Battigheim, and another large one of Borsdorp, of the height of Ten Foot, besides a large Muscat Pear-Tree. The 31st ditto, an Orange-Apple, and a Wine-Apple, and a small Pear-Tree, called Glas. The 1st of April two Stocks of the Bak-Apple, a white Battigheim-Apple, an Orange-Apple, a Winter Bergamot, and a Sugar Pear-Tree. And the 6th of April a Stock of the red Wine-Apple, and a Branch of a Heart-Cherry-Tree upon a Black-Cherry Root; as also a Medlar-Tree upon the like Root; all these were together set in good Earth, as also what you sent for a Proof, which was kept in a Pot till that time. I can now tell you that all are still fresh, as also that the forward Pears, and the great Apple-Tree of Ten Foot high begin to shoot apace; you shall have Notice how it continues to grow. I must likewise acquaint you, that the Weather has grown cold again of late, and we have had a hoar-frost with much Snow; the Snow lay two Days on the Ground, and it froze hard. The Weather becoming warm again, we visited the Trees several times, and found them fresh. The Day before our coming
away

away, being the 4th of May, we perceiv'd the Blossoms on the Cherry-Tree, the early Pear-Tree, and the Heart-Cherry-Tree. Towards Autumn, if it please God, we shall plant a Wood, chiefly after your new manner, with which I am very much pleas'd. I long to have the whole printed; in the mean time I am sorry for detaining you so long. I am

Your good Friend, &c.

F. A. H. Z. W.

This was confirm'd by a second Letter. Now it may seem that I bring these Evidences only to give weight to my own *Experiments*, and to shew the favour I am in with great Lords; whereas this difficult Operation, by the means of Fire and Mummy, seldom or never succeeds. This is true, and I cannot deny but I have been often convinced that few People understand how to manage this Work: 'Twas for this Reason I gave Assurances that I would not only alter this Method, but also propose others more convenient for an *Universal Multiplication*, as appears by this Work, which I have begun. In the mean time, as this Method has succeeded well to me, and to some others, I shall not be afraid to bear witness to the Truth, and to insert it here; for if it was a Falsity, I should not have receiv'd such Letters; therefore I shall take the liberty to give a place to what follows.

S I R,

I May justly boast of having refuted the Critics and Adversaries of the Art of *Multiplying Plants*, and I ought to cry *Prosperity* to Mr. Agricola, Master of this Art. I can say, that all the *Trees* I have treated according to the Precepts and Rules of the Author of this Invention, are not only fresh and lively, but for the most part *blossom* to admiration. And what is more, I have grafted a *Mulberry-Branch* upon a *Vine-Root*, which be-

gins to flower to a wonder, &c. These *Trees* promised very fairly at first, but as I heard afterwards, some of them died from time to time, I don't know the reason of it; but according to my best knowledge, some of them arriv'd to a perfect growth, and subsist still. And now I shall communicate my own *Experiments*, which are true and certain, and such as I discover'd in Nature, only they are drawn something too little. The 19th of *May* 1716, these Draughts were publickly presented to the honourable Assembly of Deputies at the Town-house, and were afterwards sent to a Place of Importance.

I have already said, that the first attempts and tryals of grafting the *Roots* were made the 4th of *December* 1715, being the most proper Season for this Work. I began first with the *Branches* of exotic *Trees*, as well *Citrons* as *Laurels*, &c. I hardly grafted any of 'em upon their own *Roots*, but upon strange ones, as it came into my Head; besides through haste, I had not always a due regard to the heat of the Fire, and did not sometimes take care to plant them deep enough in the Earth; when they had been there some time, I could not perceive much change, they sprouted out a little indeed, but after an exact Inspection I found that did not happen by any help from the *Root*, but through the warmth of the place where they were. In the Month of *February* they began to die here and there; some became black at bottom, while others were in good condition. To penetrate into the Reason of this change, I took out several *Trees* one after another, and found that in some there was a Putrefaction in the *Incision*, which had infected the little *Stocks* and the *Root*; this I attributed to the too great quantity of *Mummy*, and my too much care to close the Overtures, which hindred the Passage of the Juices. In another little *Tree* which I examin'd, I found the *Incision* right, and the *Branch* sound, but the *Root* was dead; and when I reflected on it, I perceiv'd that not having dress'd the *Root* at bottom with *Mummy*, there had
entred

entred too much Moisture, which had corrupted the Substance of the *Root*, and hindred the growth of the *Stock*. Another *Tree* I found pretty sound under Ground, and the *Root* fresh, but the *Stock* above appear'd scorch'd, and began to die, it was also a little mouldy; this I suppos'd proceeded from too much wet, which was occasion'd either by the nature of the place itself, or by the too plentiful watering of the *Tree*.

In short, I found natural Causes for all, and was then fully convinc'd, that as the extraordinary length of the Winter (which lasted till *April*) hindred their being carried out into open Air, they had thereby been scorch'd and began to mould: nevertheless a great many of them were preserv'd, especially the *Citron* and *Laurel Branches*. When I for Curiosity took some of them out, I saw with satisfaction that they had taken *Root*, but in different manners; for the callous Matter shew'd itself in some of 'em above the Joint, and in others below it, as may be seen in *Plate 16. Fig. 3, 4, 5.*

These Figures represent *Laurel Branches* grafted on the *Roots* of other *Plants*, and if I mistake not on *Plumbtree-Roots*, by the means of *Fire* and prepar'd *Wax*; on one of these *Roots* one might see more than ten other long, and yellow *Roots*, which grew out of the Callus (*k. k. k.*) and between the *Mummy* several little young *Roots*, represented by (*l. l. l.*) and I could easily judge that they did not proceed from the strange *Stock*, for they were quite different, and therefore I took off the *Mummy* from one of 'em, and visited the *Incision*, and found that the *Root* had made a callous border round the cleft of the *Laurel Branch*, and that from thence the new *Roots* proceeded. I perceiv'd at the same time, that the interior Conjunction was already made; all the *Roots* on which these two *Branches* were grafted were sound and fresh, and on some of 'em were come little *Leaves* here and there; this Inspection gave me sufficient occasion to contemplate the Possibility there is in Nature.

Having chosen a fine Day in the Month of *April*, when it was easy to dig up the Earth, I eradicated several *Apple*, *Pear*, and *Apricot Trees*, I divided the *Roots* into several Pieces, and fitting proportionable *Branches* to 'em, dress'd 'em with *Mummy*, as *Fig. 1.* and *2.* represent, then I planted them: I also took a long *Apricot-Root*, and grafted several *Cuttings* on it by the *Entail Incision*; I dress'd 'em with liquid *Mummy*, because I look'd upon the dry as dangerous; I tied 'em cross-wise, and set the *Root* length-wise in the Ground, but not deeper than a Hands breadth, as *Fig. 6.* shews; in *May* the *Apple-Branch* began to shoot, which is represented by *Fig. 1.* but this went on very slowly, as appears by (*a.*) On the contrary, the *Shoots* began to appear apace at the bottom of the callous Matter, according to (*c.*) as also several small *Side-Roots*, as per (*d.*) and some large *Roots*, which hung down from the callous Border, as is shewn by (*d. d.*) the *Root* shot out too apace, and there came little *Leaves* upon it here and there, as (*f. f.*) clearly shew. Now as the *Suckers* grew upward vigorously, the nutritive *Juice* could not rise sufficiently into the *Branch* which was grafted on the *Root*, and this I thought the chief Reason why that did not grow as well as the rest. On the other hand, there were other *Branches* which were in better State, which little as they were, had nevertheless their *Flowers*, as (*g.*) shews in the second *Figure*; these *Flowers* were also as perfect as could be seen on large *Branches*; the *Callus* also was well clos'd, and from thence the *Roots* grew as (*b.*) represents, which might be very easily distinguish'd from the main *Root*, tho' pretty big; in the mean time this piece of *Root* was fresh and lively, and began to shoot out, as is shewn by (*i.*)

As to the great *Root* which we see in *Fig. 6.* it not only began in *May* to grow out with *Callus* at the two Ends (*o. o.*) but there came also out of it new *Roots*, as (*r.*) shews. From the *Root* as well before as behind, and in the middle, there sprung

sprung up young *Suckers* or *Trees*, which were very agreeable to see, as (*p. p.*) represents; near the Ligature one might see new *Roots* shoot out, which represented the conjugal Union, for the two Parts were now become one; this Discovery proved sufficiently the Truth of our Observations, and shew'd wherein the Foundation of grafting on the *Root* consists, *viz.* that the *Roots* when cut into great or small Pieces, not only remain alive, but also shoot out both with new *Stocks*, and new *Roots*; as also that the principal *Root* and *Stock* unite one with t'other, and in short *Burgeon* and *Blossom*, which was what we were engag'd to prove.

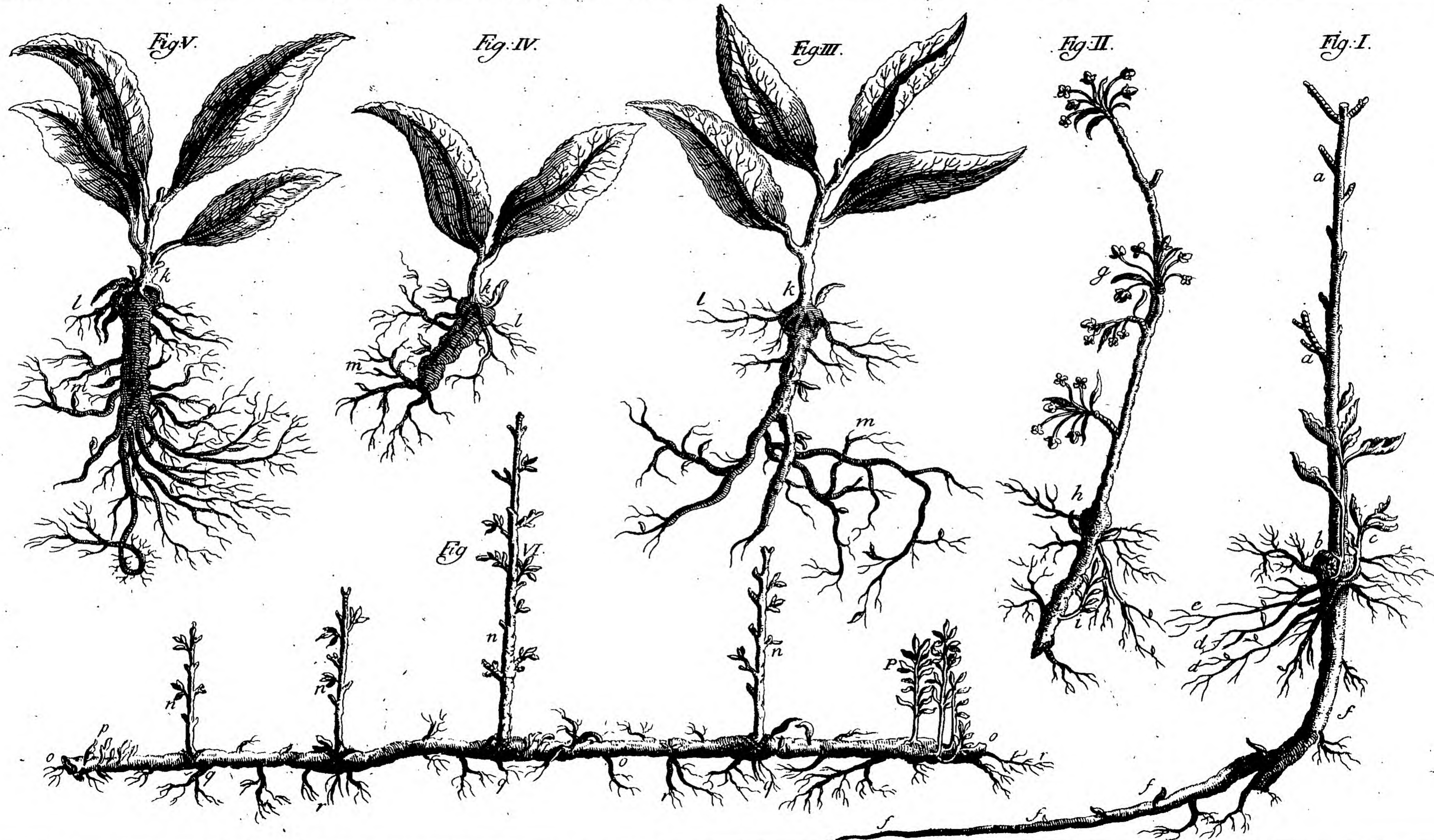
But before I make mention of the Usefulness of these Operations, some curious People will perhaps enquire concerning the Fate of the Principal Stocks of *Apple*, *Peach*, and *Apricot-Trees*, which were four or five Foot high, and which in *December* last became perfect *Trees* by this wonderful Art; for People were fully persuaded that they would *Blossom* and produce *Fruit* in the Spring: I answer that they died thro' the severity and long continuance of the Winter, but the *Roots* shot out again, and some of them arriv'd to the height of an Ell; there were some of 'em which seem'd to be still alive in the Month of *June*, and in a condition to shoot a-new, but they wanted sufficient Vigour, for the extreme cold had too much compress'd the little Fibres so that the nourishing *Juice* could no longer penetrate it. This sight gave me but little Satisfaction, but Who dares murmur against the Decrees of Providence? Some perhaps may ask what became of the *Pinks*? To which I answer, that the greatest part of 'em were lost, nevertheless some of them came to good, two of which have this Year born very fine *Flowers*; 'tis enough by this Experiment to have shewn the Possibility of the thing.

Lastly, We must not forget the sixteen large *Branches* or *Stocks*, which, by means of *Fire* and the vegetable *Mummy*, or prepar'd *Wax*, became perfect *Trees* in the *Wood*; they appear'd wonder-

wonderfully fine, even till the Month of *April*, so that no Body doubted but that the next Month they would shew themselves with their *Leaves* in the greatest Perfection: But towards the End of *April* there happen'd such a furious Storm, that though they were supported with Props, they were nevertheless thrown down by the Violence of the Winds. This gave Occasion to my Invention of *Forks*, whereby *Trees* may be secur'd from the like Violence, tho' never so extraordinary.

Notwithstanding this Disappointment, I had still the Satisfaction of seeing both that the large *Stocks* and *Branches* stood out the extreme Severity of the Winter, and that there had proceeded pretty much of the callous Matter as well from the *Roots* as from the *Stocks* and *Branches*; so that I am assur'd, if this Accident had not happen'd, they would all have been perfectly cur'd this Year, how great soever the Wound had been. In short, I found that both the *Stocks* and *Branches* were open'd a little, and endeavour'd to shoot. But Time and Experience will make further Discoveries.

§ 4. To conclude, we have only a Word to say of the great Advantages that may be drawn from all the above-described Methods, as well for the Improvement as the Encrease of *Plants*, whether in *Gardens*, *Plantations* about *Country-Seats*, or *Woods*. I have treated of them in my *Succinct Account*, and they may be easily comprehended, when one considers that *Trees* or *Skrubs* may be rais'd from every *Leaf*, *Bud*, *Branch* and *Root*; of all which there is a prodigious Quantity, as well in *exotick* as in *common* and *wild Trees*. Let us only reflect on the vast Encrease which may be made by the *Seed*. For Example: Suppose a Man has a large *Apple-tree*, which yields him five Sacks of *Apples*, in each of which Sacks there are five hundred *Apples*. Now we generally find ten *Kernels* in an *Apple*, and supposing that of these only five should prove good, yet this would amount to ten thousand young *Trees*. And is not this a vast Increase? But if I should
exten-



extend my Calculation to the *Buds* and *Leaves*, to how many Millions would the Number amount? But I leave that to the Curious in *Gardening*, who will be able to inform themselves better in this Increase by their own Assiduity and Labour. May it please the Almighty Author of all Abundance to bless these Undertakings, that his infinite Goodness may be prais'd throughout the whole World, and his Name glorified for ever and ever.

P L A T E XVI.

Which gives a true Description of the following Curiosities design'd after Nature, shewing how the Branches united with the Roots, and blossom'd and shot forth at the same time both above and below. These Curiosities were publickly shewn to abundance of People of Judgment and Distinction in the Town-house of Ratisbonne, May 19, 1716.

Fig. I. *Is an Apple-tree; prepar'd the 17th of December 1715, in the Stove, by the Means of Fire and Mummy, and which began to shoot the next Spring, tho' very slowly, as is shewn by (a. a.)*

(b.) *Is the Mummy which remain'd whole all the Winter, and crack'd only here and there, from whence proceeded little Roots that grew out of the Callus which had spread it self on the Stock.*

(c.) *Represents the Branches which grew out of the Root, and which being left there too long, depriv'd the superior Branches of the nourishing Juices, and drew them to themselves.*

(d.) *Are new Roots which shot from the old Root, and produc'd little Leaves.*

(e.) *Is a long slender Root of a different Colour from the rest, from whence 'twas inferr'd that it proceeded from the Stock.*

(f. f. f.) *Represents the Piece of cut Root on which the Stock was grafted, which shot new Roots, and at the same time produc'd young Leaves.*

Fig. II.

Fig. II. *Represents a Branch of Apple-tree which grew. It was grafted in December, according to Art, on a piece of cut Root, and in May it flower'd very prettily, as is represented by (g.)*

(h.) Is the Mummy, by means of which new Roots shot out, which might be known by their Colour.

Fig. III. *Represents how by the same Means of Mummy and Fire a Laurel-Branch was grafted on a Piece of cut Plumb-tree Root, which in the Winter shot Roots in the following manner; since it was not of the usual sort, there came out of the black Mummy eight or nine short yellow Roots, which grew perpendicularly out of the Laurel-Stock, as (k.) shews; the Laurel had also shot out little Roots and Leaves between the Callus, but they were not alike; as also a little Leaf represented by (l.): The Root was likewise provided with little Fibres or new Roots, and here and there with young Leaves.*

Fig. IV and V. *Represent likewise Laurel-Stocks which were grafted on Apple and Pear-Roots, which shot out their Roots above and below. The Root also sprung out with new Roots, as is shewn by (k. l. m.)*

Fig. VI. *Represents a long Apricot-Root, on which four large Branches of the same Tree were grafted by the Entail Incision with dry Mummy; they began to shoot, as is shewn by (n. n.) and by means of the Mummy and the Ligature produc'd new Roots, according to (q. q. q.) In the mean time young Apricot-Branches shot out on all sides with Leaves, as is shewn by (o. o. o.) At the Extremity of the Root there had grown a thick callous Matter, from which there visibly proceeded several young Roots.*

The End of the First Part.



PART II. SECT. I.

CHAP. I.

A Recapitulation of the Principles propos'd in the First Part, and an Enquiry as to what is meant by them, whether an Universal Propagation, or only Particular ones.

§ 1.



HAVING already given Reasons why this Second Part ought to be treated briefly, I shall therefore only repeat some few things from the first by way of Connection, and consider whether, among the Propositions which are there laid down, there be any which may be applied to an *Universal Multiplication*, or whether they be only applicable to *particular* Propagations; I shall also at the same time shew how they may be made use of to Advantage.

§ 2. In the first Part, Section I, we have evidently proved,
1. That there is in all *Plants* a motive Principle, which extends it self to all their Parts, as well those in the Earth as those above it, and which is multiplied in a wonderful manner. 2. That this *Principle* or *Being* is Elementary or Material. 3. That it is divisible, and remains (tho' in an incomprehensible manner) entire in its divided Substance; which confirms this *Axiom* of

Philosophers, *That the whole is in a Part, and a Part in the whole Being.*

§ 3. We have moreover sufficiently demonstrated in Sect. I. Chap. III and IV. that *Plants* consist likewise of a Body organiz'd or modified in different Manners, in which the vital *Juices* are in a continual Motion and Circulation, as long as the motive Principle is within, or united with them; and that when it is so interrupted by any of those Accidents, which we have particularised in Chap. V. that it can no longer exercise the Office it receiv'd at the Creation, then it is obliged to quit its Habitation, whereby vegetable Bodies die, and are subject to an entire Corruption.

§ 4. Now since the whole Work rests upon this Foundation, that whatever thing has a living Essence in it self, may be brought by Art to grow, when the Parts upon which this Essence is to act are well dispos'd; therefore upon this fundamental Principle all manner of Experiments have been made. The Certainty of it was clearly shewn in Plate IX. of the first Part, where it was demonstrated, that the *animating Essence* not only diffuses its Virtue thro' the whole *Tree*, but also unites it self inwardly with the vital *Juices*; and that the Organs of the *Tree* in the inferior and superior Parts are nicely adapted to each other; as also that what is at bottom, is as that which is at top, *viz.* that the *Branches* and *Twigs*, by the Means of the interior Essence, and the Assistance that may be given from without, may become *Roots*, as on the contrary the *Roots* may become *Trees*, (being treated in a requisite manner) by means of the same Essence. Some indeed have been of Opinion, that I only made use of this as a Philosophical Circle, or Subterfuge; but the Experiments which have been made for some Years past by several curious Persons, and which I have represented in Part I. Sect. 2. Plate 6. have sufficiently prov'd my Propositions; yet I wish they had made their Essays on a greater Number of *Plants*; for if
they

they had invented the Art of a speedy and universal Propagation of all *Plants*, I had been eas'd of a great deal of Trouble. But it seems this Theory appear'd too hard for 'em, as indeed all Beginnings are difficult. Since then the Lot is fallen upon me to fix a Foundation for a general Encrease of *Plants*, let us see who will attempt to subvert it. In the mean time I can assure those who have a mind to build upon it further, and to examine things yet more nicely, that they'll be entertain'd with many fine Discoveries, which will convince 'em that my Propositions are well founded.

§ 5. This being premis'd, the first Experiment was made upon the Principle of Life, *viz.* upon the *Root*, as being that part which gives Life to the *Trunk* and *Branches*, and supports it. For this is the first *Shoot* which attracts to it self from the Earth the *Alimental Juice*, as is plainly represented in Part I. Sect. 1. Chap. 2. Moreover, we have shewn at large, that no *Plant* can live or endure without a *Root*, as may be seen in Sect. 1. Chap. 3. of the same Part.

The first Method of *Multiplication* consisted in dividing the *Roots*.

Of the Division of ROOTS.

After mature Consideration, we reason'd thus: If by an artificial Separation we may produce *Plants* from all Parts of their *Roots*, this must necessarily be a good Beginning for an universal *Propagation*; for, upon Enquiry, we shall find the Number and Extent of the *Roots* under Ground to be equal to the Head of the *Tree* with all its *Branches*, *Twigs*, *Buds* and *Leaves*. Yet after having duly weigh'd the Matter, I perceiv'd that this way was not proper for a general *Multiplication*; for the *Root* was not given to the *Tree* for that purpose, tho' the antient *Herbalists* had for a Proverb, *That by the Seed and the Root all things are propagated*; for they knew of no other manner. As to the

Universal Multiplication by the *Seed*, the Excellency of this Method has been largely treated of in Sect. 2. Chap. 1 and 2. And ev'n as to a *Multiplication* by the *Roots*, we may conclude from the holy Scriptures, that it was much practis'd in the first Ages. And I am of Opinion, that the Contempt which some People have shewn of both these Methods proceeded only from their Laziness. They could have wish'd that every thing had sprung up of it self, as having often seen whole *Woods* rise they knew not how; they therefore imagin'd that *Fruit-trees* might grow up the same way; but there is a great deal of difference; and even wild *Trees*, if we intend their *Multiplication*, must be treated with the same Care as others. Some say it's not worth the while to fatigue one's self in digging up the *Roots* of fell'd *Trees*, in order to cut them in pieces, and plant them anew: But prudent Owners of *Country Plantations* and *Woods* will consider how long the *Roots* remain alive under the Earth, sometimes thirty Years or more, before they decay. If this was not so, the Ground being clear'd by the rotting of the *Roots*, might be cultivated and turn'd to some other Use. Whereas the *Roots* do in effect cry out from under the Earth, Open our Prison, that we may enjoy the Air and the Sun, and your Pains shall be largely rewarded.

§ 6. Though I at first thought I had found out an *Universal Multiplication* by the division of the *Roots*, yet upon Tryal I found a great many Inconveniences, which hindred me from maintaining my Fundamental Principle: In the first Place especially, because there are many *Plants* which are but slenderly provided with *Roots*: *Secondly*, because many People cannot find in their Hearts to deprive their *Lemon-Trees*, *Apricot-Trees*, &c. of their large *Roots*, for fear of killing them, though this apprehension is groundless; for Experience shews us, that when we cut the *Root* of a *Tree* in a due manner, and dress the *Incisions* as they ought to be dress'd, the upper part gains more Nourishment by it, and grows the better; for we know that the *Roots*
multiply

multiply as well as the *Branches*, and consequently ought to be discharged of their Superfluities, as well as the others, that so the *Stock* may receive a greater Share of *Sap*. 'Tis also something particular, that if we fell a *Tree* close to the *Root*, that *Root* shall remain alive, and even augment, tho' no body knows why. Now having after a thorough Examination found that this way is not proper for an *Universal Multiplication*, it may perhaps be ask'd why I propos'd and explain'd it by *Figures*: To this I answer, that though one can't by it effect an *Universal Multiplication*, it is nevertheless absolutely necessary for particular Propagations.

§ 7. In the first place I shall speak of the Utility of dividing the *Root* in exotic *Trees*. 'Tis known that Persons who have a great many *Citron*, *Lemon*, *Orange*, *Pomegranate*, *Laurel* and *Cypress-Trees*, &c. transplant them every three or four Years, and discharge them of their Superfluous *Roots*; which being done after their manner, they throw 'em away, little thinking how many hundreds of *Trees* they destroy by that means, this Science being hitherto unknown to them; but now they know it, they will certainly be at a little Expence and Pains to gain Advantage from what I have to propose, especially since I shall shew 'em as well the Profit, as the way of Operating. When a *Tree* which has not been transplanted for some Years is taken from its Box or Case, and the *Roots* are found to grow too close together, cut off the superfluous *Roots*; and if you find many large *Roots* in the upper part near the *Stock*, you may freely take off some of them, dressing the Places with *Mummy*, and this will do the *Tree* a great deal of good, provided you spare the main *Root*. If you would make use of the *Roots* you have cut off, you must first take away abundance of little superfluous *Fibres*, which are of no use, and then cut the *Roots* into Pieces, of the length of your little Finger, or something longer, after which you must pare both Ends smooth, and cover 'em with the following *Mummy*.
Take

Take half a Pound of *Virgin-Pitch*, and two Ounces of white *Wax*; melt them together in a little deep Pot over a Chafing-dish, and when it is so far cool'd as that there exhales no more Smoak or Vapour (as in Plate 17.) dip in the Ends of the *Root*, the lower End a little farther than the other, then let them drop a little, and afterwards put the *Root* in cold Water, as in the Figure. The *Roots* thus prepared must be set upright in *Pots*, *Boxes*, *Tubs*, or even in Beds of Natural *Earth*, so as one End may appear a little above the Earth, then the Earth must be press'd down hard about the *Roots*, and for the greater Security you may fix little Props to them, that they may be set the firmer in the Earth. If any body has a mind to plant them length-wise, he may do it, but then he must not set 'em deeper than the thickness of one's Finger, otherwise they will choak; you should also set up a bit of Stick near 'em, to serve for a Mark; this being done, you must keep them for some Days from the Sun's Heat, and water them in a shady place; but those which are planted in Beds may be cover'd for some time.

§ 8. I have tried this way myself upon abundance of Exotics, as *Citron-Trees*, and others, and have succeeded well, having not only sent many of these *Roots* which had sprouted to several Persons of Distinction, but also kept several which I can still shew to any body that pleases to come to my *Garden*; besides, several Gentlemen have imitated me, and have found the like Success. What is very observable is, that I always found the great *Roots* to sprout first, the midling afterwards, and the small ones not till the next Year, but they all remain'd fresh and sound; whether it was that these last had not *Sap* enough, or were too weak, or for what other Reason, Time will shew. It may be queried whether these *Sprouts* will become wild *Trees* or not? To this I can make no Reply: But I believe that when we cultivate grafted *Citron-Trees*, they will take a midling Nature, that is to say, they will bring forth *Fruit* tolerably good; for a good
Graft

Graff which has been many Years upon a wild *Stock*, and is united with it, will by means of the Circulation of *Juices* certainly communicate its good *Sap* to the *Root*; and on the other hand, the *Sap* which is in the *Root* will rise towards the Top, whence we may conclude, that this temperament and mixture of *Juices* must necessarily produce something better than what is wild.

§ 9. I come now briefly to examine the Advantage of this Operation when practis'd upon good *Fruit-Trees*. We have already spoken of the difficulty which some Owners of *Trees* make of depriving them of any of the large *Roots*; now if this Difficulty subsists, our *universal Multiplication* must drop of course. Again, we find that most of our *Fruit-Trees* are grafted, from whence there results this doubt, Whether if we plant a large *Root* of a *Pound Pear-Tree*, which is grafted on a wild *Stock*, we can be sure that it will not produce wild *Fruit* instead of good *Pears*; this I cannot decide, till I am better instructed by my own *Trees*, for as yet no body has taken any Notice of this matter. It is nevertheless certain, that from this Operation there accrues another Advantage, which is, that when a *Tree* becomes dead in the upper Parts, or when the Frost kills it, or it is grown so old that we can no longer allow it a place in our *Gardens*, we may take out the *Root*, and ordering it as before, may acquire a great many new *Trees*, which if they don't bear agreeable *Fruit*, are nevertheless capable of being improv'd by *Inoculating*, &c.

§ 10. This Method meets with the same Opposition as to the Propagation of *Vines*, for few People care for dismembring their *Vines* of their *Roots*, and yet there is an Advantage in doing it; for being cut to bits, and order'd as above with *Forest Mummy*, (that is with common *Pitch*) and planted in the Earth they will spring up with great encrease; and this way will turn to account, especially after *Vines* have been injured by a hard Frost,
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for then we may root 'em up, and order 'em as I have said before, and plant them, and thus we may have *Vineyards* cheap, without being oblig'd to any body.

§ 11. This manner of cutting the *Root* might be yet better practised in the *Woods*, where *Trees* are felled; for the vacant Places might be thus supply'd, after the *Stumps* were extirpated, which otherwise would rot in the Earth; for Experience shews us, that Rain, Snow, Wind, &c. easily penetrate thro' the *Pith* of the *Stump* of a *Tree*, whereby the *Root* is scorch'd, and its Growth prevented.

§ 12. I believe that in case after the felling of a *Tree* the Top of the *Stump* was immediately made smooth with a Knife, and afterwards cover'd with prepar'd *Pitch*, so that no wet might penetrate the *Pith* or *Wood*, the *Trunk* would shoot out again plentifully, especially those of *Oaks*, *Birch-Trees*, *Ash-Trees*, *Beech-Trees*, and *Wild Apple* and *Pear-Trees*, and in a little time such *Stumps* would become a new *Wood*. I should be very glad if any *Forrester* would make the Experiment, to see whether this Opinion be founded in Nature, or whether it be no more than Speculation.

§ 13. But to return to our Operation upon *Roots*: Many People, as has been said, are cautious of taking the *Roots* from their *Trees* for fear they should die, and themselves lose all their Profit; and indeed they have some Reason; for the generality of *Woodcutters* are so inexpert, that they might have Cause to repent it; such I advise to forbear these Experiments, or only to make them upon wither'd or Frost-bitten *Trees*, or such as they are obliged to extirpate for other Reasons; the *Roots* of such they may take up, treat them as was before explain'd, and plant them anew.

§ 14. Lastly, To explain myself as to the Place where this Operation may be best perform'd, I am of Opinion, that they who are the *Proprietors* of large *Woods* will reap most Advantage

tage by it, for in felling their Timber they may at the same time extirpate the *Roots*; the Expence and Labour will not prove so great as some may imagine, since it is not necessary to dig very deep, the *Roots* not penetrating far into the Earth in *Woods*, but chiefly extending themselves in Breadth, which is the Reason that they are torn up in stormy Weather. But suppose it requir'd some Expence and Trouble, the Profit that would result from it would be a large return. They who have a mind to put this Invention in Practice, may make use of the following Method.

1. Dig a deep Trench or Conservatory in the *Woods*, which may be cover'd with Boards at your pleasure.

2. There keep your *Roots*, being dress'd with *Mummy*, till you have occasion to plant them.

3. For this, *Autumn*, *Spring*, and *Midsummer*, are the most proper Seasons; till then you must keep them as before directed.

4. You should be well inform'd of the manner of ordering 'em, as also of the use of the *Root-Bench*, which is represented in *Plate 15*.

5. We have also described the way of dressing them with *Wax*. Every one may do as he thinks best, but for my part I should make use of an oblong Kettle with Handles, this must be set on a Trivet, and being a third part full of common black *Pitch*, you must let it melt over a Coal or Wood Fire, and then cool a little, then dip in the Pieces of *Roots*, which must afterwards be put in cold Water, if the Weather be hot, but if not, you need only lay them on a couple of Sticks till they grow cold.

There remains still something to be said concerning the *Planting* of the *Roots*; this may be done in two different manners. *First*, you may set the *Root* upright in the Ground, and to this end you must dig proportionably deep in the Earth, and order it so that the upper End may come a little out of the Earth, and then press the Earth close down about it. The other way is to set the *Roots* length-wise; they who choose the latter way must make their Holes oval, and not too deep, and then cover

the *Roots* with a little Earth. As to what is to be done in order to prevent their being trampled upon by Cattle, we leave it to the care of every *Proprietor*. And here we finish our first manner of *Propagation*.

§ 15. I pass now to the *Second Proposition*, which is treated of in the First Part, *Plate XI*.

Cutting the Branches and laying them in the Earth.

And here this Question immediately presents itself, Whether this manner is likewise Universal? I could very well answer affirmatively, if I had not found some great Difficulties in it. For,

1. All *Trees* and *Shrubs* have their great and small *Branches*, their *Twigs* and *Shoots*. Now no *Shoot* can subsist unless join'd to a *Twig*, no *Twig* unless fix'd to a small *Branch*, no small *Branch* without depending on a greater, and no great *Branch* without being fastned to the *Stem* or *Trunk*. This is general.

2. One may cut the *Branches* and *Twigs* in such a manner, as that they may always remain fast'ned one to another. For Example; when there is a long *Branch* to multiply, begin with a little *Branch*, and cut it off cross-wise, so as it may remain on a Piece of the great *Branch*, as is better explain'd in Sect. 3. *Plate 11. Fig. 2. c. d* than by a great many Words.

3. We have described at large in the First Part how they are to be treated with *Mummy*, and propped up, and how they are to be planted, that they may take *Root* and germinate.

§ 16. The Reason why this Discovery cannot be taken for an *universal Propagation* is, because I have found, after a strict Enquiry and reiterated Experiments, that the little Piece at bottom is always dispos'd to multiply, and to take more Care of itself than of the *Branch* which is upon it, for it sends out a callous Matter, from whence the *Roots* proceed; and when it has receiv'd enough of the nourishing *Juice* its *Pores* open, and *Shoots* come forth, while the *Branch* which is above has

no Nourishment, and consequently dies by little and little. I remedied this in some measure, by making an Incision as well in the *Branch* as in the Piece at bottom, and putting something over it, and dressing it afterwards with *Mummy*, by which means the *Branch* as well as the Piece took *Root* afterwards. I cut away the *Shoots* from the little Piece at bottom, and then the *Branch* began to sprout out.

§ 17. As to the Usefulness of this Proposition, it may be practis'd as well on exotick *Trees*, as on all sorts of common *Trees* and *Vines*: The worst is, that the Work is a little troublesome; and when they are not taken good Care of, they often die; for which Reason I cannot apply this Proposition to an *Universal Multiplication*.

§ 18. We have also taken notice in the same Plate of a particular Manner of Setting or Laying *Plants* in the Earth. It is certainly very advantageous; and if one could as easily bend large and old *Stocks* as the small *Branches*, I would not desire a better way than this, for then I could soon render it *universal*. But as this may be more fitly reduc'd under my last and best Proposition, I shall say nothing of it till then.

Lastly, Since many have laughed at the Experiment of the *Leaves* which I cut off near the little *Buds*, Plate 11. Fig. 1. and have rejected it as a Folly, especially if any should incline to be at the Pains of employing a considerable Extent of Ground in this sort of Plantation: I freely confess, that since we now know something better, we have no great need of such Discoveries. Nevertheless, there are a great many curious Persons who think it very diverting to see a *Tree* proceed from a *Leaf*; for in *Gardening*, as in every thing else, the Proverb proves true, *Varietas delectat*; Variety is pleasant: And I dare say, that many People take more delight in a little *Shrub* of their own Planting and Raising, than in all their larger *Trees*. Here I end this

Proposition, which is no more *universal* than the other, and pass to the following.

§ 19. The *Third Proposition* concerning

The Production of the Roots, by means of the Graffing-Chizel.

This was it that gave me the first Thought of a general Propagation, engaged me in profound Speculations, and subjected me to Millions of different Judgments. When I first publish'd my Invitatory-Letter, which was the 15th of *January* 1715, I had no other end, but to learn what Persons of Curiosity and Learning would think of it. And as that Letter is become very scarce, and hardly to be met with, I have inserted it here as follows.

‘ This is to give notice to all Persons who have Country *Plantations* or *Gardens*, or who are curious in *Fruit-trees*; *Shrubs* and *Plants*,

‘ That there is discover'd by the Truth of Nature, which is infallible and universal, a surprising Way of multiplying all manner of *Trees*, whether *Exotick* or *Domestick*, above a hundred thousand fold, by which Method we may in any Place or Climate in the World, with little Charge or Trouble, from all the *Buds*, *Shoots*, *Twigs* and *Branches* (of which there are many hundred thousands on every *Tree* and *Shrub*) raise so many *Trees* or *Shrubs* in two, three or (at furthest in) four Months time; and this in all Seasons, even late in Autumn, so that the *Roots* of every *Bud* and *Branch* will hang downwards without the help of Pots of Earth, or any thing of the like Nature.

‘ The Advantages of such an *universal Multiplication* consist herein.

First, as to Pleasure-Gardens.

‘ That whoever has a few *exotick Trees* or *Shrubs*, as *Orange*, *Lemon*, *Citron*, *Pomegranate Trees*, &c. as also, *Cedars*, *Cypress*, *Laurel*, *Myrrh*, *Olive*, *Tamarisc*, *Turpentine*, *Palm-trees*,

‘ *trees, &c. Perwinkle, &c.* may cut off thousands of *Buds, Boughs*
 ‘ and *Branches*, according to the said Art, which shall shoot the
 ‘ same Year; and the second or third (according to the Climate
 ‘ where it is done) shall flower and bear *Fruit*.

Secondly: As to Plantations about Country-Seats.

‘ That if any Person has but a small Number of bearing *Trees*,
 ‘ and a great Extent of vacant Land, he may, in less than a
 ‘ Year, by this Means cover whole Fields, Mountains and Val-
 ‘ lies with them, which, in three Years time, will bring him
 ‘ great Quantities of *Fruit*.

Thirdly: As to Woods.

‘ That by this Art we may in all Places supply the want of
 ‘ *Wood*; and where there is only a little *Coppice*, make two or
 ‘ three *Woods* of it, which in four or five Years time will excel
 ‘ all others.

‘ Any Body who has a mind to learn this curious and useful
 ‘ Science, may apply themselves to the Person who has confirm’d
 ‘ these Presents with his Hand and Seal, and who will give them
 ‘ all the necessary Information they can desire.

Every one will see by this that I had no Design of getting Mo-
 ny from any Person for my Information; for I asked nothing,
 and had only a mind to know what People would think of this
 Discovery. And indeed it was not long before they reason’d up-
 on it in a strange manner. Most look’d upon it only as a Chi-
 mera or a Banter; for, said they, What good can we propose to
 our selves from a thing which is of no use? And what will these
Branches do with their *Roots* in the Air? They’ll find but little
 Nourishment there, but will wither and die thro’ the Heat, Cold,
 Wet, &c. But this Letter happening into the Hands of one
 of the greatest Princesses in the World, she thought it was not

to be taken strictly, according to the Letter, and therefore was pleas'd to order me a Hearing, and favour me with the Liberty of explaining my self, of which I have spoken more particularly in my *Succinct Account*, and elsewhere. This little Spark immediately kindled such a Fire as could hardly be extinguish'd; whereupon I explain'd my self, and gave to understand, that this Production of the *Roots* ought not to be consider'd formally and actually, but only materially and virtually; that is to say, that by the Operation which is perform'd, the *Roots* grow indeed of themselves on the *Trees*, so far as that one may perceive the first Beginnings of *Roots* upon the *Callus*; but then the *Branches* must be cut and planted in the Earth with the *Roots*. The 12th Plate shews clearly how this Operation is perform'd, as also how one must place the *Grafting-Chisel*; and in what manner one must dress the *Branches* with *Mummy*, cut, and re-plant them.

§ 20. Now since this Method may be practis'd every where, the Question is, Whether it may not be look'd upon as a manner of Propagation that is *Universal*? And indeed it might be so reputed, if it was not attended with one Circumstance, which is, that we must wait too long for the Success; for some exotick, and many common *Trees*, as *Firr-trees* and *Pines*, &c. produce not their callous Matter in nine, sometimes not in twelve Months; so that it is often two Years before they come to their Perfection. Therefore I do not consider this neither as an *universal Proposition*, but as a very useful-particular one, of which the Curious may make great Advantage: For tho' the Work proceeds slowly, yet there is this Convenience, that the *Graff*, when it is cover'd with *Mummy*, requires no great Care; and besides, the *Stock* or *Branch*, before it has perfectly shot its *Root*, will in the mean time flower and bear *Fruit*. This is very useful to supply the Defect of the last Proposition, and may be practis'd on large *Branches* and *Stocks*, in which we cannot discover any Knots; but

but of this we shall speak in its place. And that the Curious may have the better Notion of every thing, I have for their Satisfaction once more explain'd this Operation in the 17th Plate.

§ 21. When you would practice this Operation on a large *Branch*, you must provide your self with broad *Root-Chizels* according to *Plate 14.* (*a. a. a.*) apply your Chizel to a proper place, and strike upon it with a Mallet, so as it may penetrate through the *Bark* to the *Wood*, of which you may take off a little, but not too much, afterwards you put a little Hemp or Flax, or a small Stick under it, then you cut away the small End of that which was rais'd by the Chizel, and dress it with *Mummy*, as is explain'd in the First Part, Sect. 3. *Plate XII.* When the callous Matter or the Rudiments of the *Root* come out, you soon after perceive the points of the *Roots*, as in (*a. a.*) in the annex'd Figure. Then you cut off the *Stern* or *Stock* under the Knots, and dress it with *Mummy*, as *per* (*b. b. b.*) and they who are not sparing of their Cost or Pains may make Stakes or Supporters, according to (*c. c. c.*) This being done, the callous Matter will come forth plentifully, will throw off the *Mummy* on all sides, and produce *Roots* as *per* (*d. d. d.*) I am sure, that they who make trial of this Operation will be sensible of the Usefulness of it; for by this Method one may immediately prepare the *Shoots*, *Buds*, and *Leaves*, so as that in order to their taking *Root* they will only want to be set in the Ground: If besides this, you cut them in their *Joints*, and dress them with *Mummy*, there is no room to doubt but the thing will answer Expectation.

§ 22. *Lastly*, I cannot but take notice that some People have been merry with me, for grafting other *Roots*, even of a different sort of *Tree*, at the bottom of *Trees* full of Callus or Knots of *Roots*; but necessity obliged me to it, for I found that the most part were infected with a Rot, to remedy which, I made use of
that

that Method; but having since found that whatsoever is dress'd with *Mummy* is preserv'd from Rottenness, and that the Knots of the *Root* remaining fresh and sound under the *Mummy*, shoot forth at last, and that the *Root* having thrown off the *Mummy*, extends itself in the Earth, I have now no more occasion to go so far about. However, one may see by this, how many Speculations a new Discovery occasions: And I am bold to say, that this Method is not altogether Impracticable, having often seen these two Parts unite very intimately one with the other; but whether the *Tree* be the better nourish'd by it, is as yet a Secret to me; that is what the diligent Undertaker will soon discover.

§ 23. The *Fourth Proposition* concerning

Grafting in the Root.

Here the Question presents itself again, Whether this is to be taken for an *Universal Method* or not? to which I answer without Hesitation in the Negative. Then it may be again ask'd, why I exalted it so highly, and assur'd the World that this was the way of multiplying *Plants* almost to the utmost Extent of Numbers, and that if this fail'd, there could be no other found; whereas now I am obliged to acknowledge that it is no way proper for an *Universal Multiplication*, by which means I have unadvisedly drawn on me the contempt of Posterity, and of all *Botanists*, whose good Opinion it will cost me some trouble to recover? But who is not sensible of the Enthusiasm a Man is possess'd with, who has made any new Discovery? It is certain his Joy has no bounds. This I proved in making this *Proposition*, for when I first thought of it, I felt an inexpressible Satisfaction in my self, and was unspeakably glad that it had pleased God to make me an Instrument of communicating any thing useful to the Publick in general, and to *Botanists* in particular. Yet serious Reflection in the Intervals of this heat of Imagination, oblig'd me to approve the Reasonableness of the Thing, tho'

tho' it never was my design to publish the least hint of it till I myself had made the Experiment. But as I have already several times said, one quarter of an Hour's Conversation, in which I could not contain my Satisfaction, drew on me all this Misfortune; for I freely confess I had my Imagination filled with the desire of beginning an almost infinite *Multiplication of Plants*, which by the means of *Fire* and *Mummy* should become perfect *Trees*, should *Blossom* and bear *Fruit*. Such Discourse coming to the hearing of a Person of Distinction, he was so pressing with me, that at length I was forced to discover the Secret to him, who agreed with me, as to the feasibility of it. In a short time several eminent Courts and other Persons of Curiosity had knowledge of the Affair, who seem'd no way to be dissatisfied with it; but as some People thought I made use of Chymistry in this Work (whereas in my Judgment 'tis only founded on the solid Principles of *Gardening*) I proved the contrary to them. Among those who testified an extraordinary Satisfaction, the late Count *Maximilian Breuner*, then Privy-Counsellor to his Imperial Majesty, was one, who was likewise one of the most forward to promote the Design by discovering to me several newly invented *Incisions*, and the like, from whence the *Count's Incision* deriv'd its Name. What he wrote to me in one of his Letters upon this Subject, among other things, is as follows.

“ I have receiv'd your Secret to my great Satisfaction, and
 “ it is almost incomprehensible, that in so many thousand Years,
 “ and among so many Millions of Souls, there has not been
 “ one before, who has thought of such a *Cultivation*, though it
 “ is so natural that it ought to have been known by every Man
 “ of Sense, &c.

A great many curious Persons sent me from time to time the like Letters, so that I, who was before pretty sure of my Affair, was hereby so far confirm'd in my Opinion, that I thought it as

certain that *Grafting* on the *Root* was the best manner of *Universal Multiplication*, as that Light was in the Sun. But perceiving that I could not always find *Roots* enough, and that People who were not very expert in taking them from the *Trees* might damage them extreamly, I took the liberty to desire those to whom it was communicated to keep it as a Secret, and not to print it, assuring them moreover, that if I found that Nature did not every where favour this Method, I would certainly invent another surer Manner upon the Plan of the 9th *Plate*, which I would immediately acquaint them with. But my Request was not every where complied with, for the Secret was printed and publish'd at *Leipsic* and *Franckfort*; but as the Copy was not Correct, a certain profound, and in his own opinion, experienced *Gardener*, about *Michaelmas* last, reprinted what I had communicated, and added a Preface to it, in which this learned Man assur'd People that he not only receiv'd those Directions from me, but that he himself had put a hand to the Work, and had found all to answer. He added, that he was far from desiring to impose upon the Publick, in as much as he thought himself obliged to love his Neighbour as himself; and in this case to prefer his Interest to his own. *Lastly*, he recommended this Invention to the Reader, saying, *Read these Lines considerately, make use of the Instructions you find in them, and you will hold yourself oblig'd to me for the part I give you in them.*

§ 24. As this learned *Gardener* publicly owns in his Pamphlet that he has tried so many times with Success the Art of *Grafting the Root*, that we may take it upon his Word that this manner of *Universal Propagation* is well grounded in all its Parts, I shall dwell no longer upon Considerations on this Subject, but will publish myself the Secret upon the Commendation he gives it: Besides, I am obliged to that able and diligent Person for bringing with so much Pains and Care this Art to such a Perfection, as to render it infallible, which is what I myself (to say the

the

the Truth) should never have dared to pretend: So that in this Case the Scholar has the Honour of out-doing his Master.

§ 25. Here follows word for word what I communicated to the Curious according to their desire; the Title was in these Terms, “ A Discovery of a new Secret for the *universal Propagation of Trees and Skrubs*, invented by *George Andrew Agricola*, Dr. in Philosophy and Physic, and Physician at *Ratibonne*, 2 April 1716.

ADVERTISEMENT.

GENTLEMEN,

“ IT has been already sufficiently demonstrated, as well to the
 “ Imperial as to the Electoral and other Courts, that this
 “ Science of the *universal Propagation of Plants* is founded not
 “ on Chymistry or Alchymy, but on the Art of *Gardening* in
 “ general. Now though the Principles and Grounds of the Art
 “ of *Gardening* appear generally simple, yet they are in them-
 “ selves Certain and Immutable. Let us only consider what
 “ Thoughts that Man must have had, who first made an *Incision*
 “ in a wild *Branch*, in order to graff a fertile *Branch* on it, and
 “ tried by such a simple Union of the two *Stocks*, to produce in
 “ time a large and full grown *Tree*. What Admiration must it
 “ have caused at first to find a great *Tree* which flower’d and bore
 “ Fruit, to have proceeded from a little simple *Bud* inserted in
 “ a small Slit of the *Bark*? What Speculations must it have rais’d
 “ in curious People, when they were told that by means of an
 “ Incision or Slit in a *Branch*, with the help of a Pot of Earth
 “ which was hung on it, the *Branch* after having been cut off and
 “ set in the Ground, would grow to be a large *Tree*? In short,
 “ let us examine all the Operations which are invented as well for
 “ the Improvement, as for the Propagation of *Plants*; and we shall
 “ be oblig’d to confess that they have but a seemingly weak Foun-
 “ dation,

“ dation, but are nevertheless sure and true in the Practice, as
 “ is well known. Now since my newly discover'd Method of an
 “ *universal Multiplication of Plants* is derived from these true
 “ Principles of the Art of *Gardening*, it necessarily follows that
 “ this Art is no Cheat, as Experience will sufficiently shew.

“ In the mean time it is surprizing, that among so many
 “ things undertaken and tried in *Gardening*, no body has ever
 “ written any thing of this, at least that I know of. It must
 “ then be a Novelty, and an unheard-of Discovery, the best
 “ Proof of which is, that I have heard a great many Persons
 “ reason upon this Subject without starting any of these Thoughts,
 “ being all as far from them as *Ratisbonne* is distant from *Rome*.

“ To conclude, I beg of you to read this Paper often over
 “ with Attention, that you may well comprehend my Thoughts,
 “ and if you find any thing that seems obscure, I desire you to
 “ give me notice of it freely, in order to my explaining it. May
 “ it please the Almighty Author of this noble Art, to bless the
 “ Work which is begun with so many successful Experiments,
 “ that so it may be brought to its highest Perfection, and bring
 “ forth worthy Fruits. In the mean time I recommend myself
 “ to you, and am,

GENTLEMEN,

Your most humble, &c.

Ratisbonne, 19 March 1716.

Georg. Andr. Agricola.

*The First Secret concerning the universal Propagation of Trees,
 and Shrubs, manifested.*

‘ Whereas the design of the Inventor is briefly to propose this
 ‘ Discovery, which the World has never seen nor heard of; he
 ‘ accordingly gives the whole in very few Words, *viz.*

Graff

‘ *Graff the new-cut Roots on Stocks,*
 ‘ *Dress ’em with vegetable Mummy,*
 ‘ *And they’ll produce perfect Trees.*

‘ And this is the true natural and intelligible way for an *uni-*
 ‘ *versal Multiplication* in all Parts of the World where *Trees* or
 ‘ *Shrubs* are to be found; and in case Nature, contrary to all
 ‘ Expectation, refuses to favour this new Invention, no other Me-
 ‘ thod will be found out for such a general Propagation.

PHYSICAL REASONS,

By which it is demonstrated that this Science of a Propagation
of Plants is certain, infallible, and permanent, and may be
practis’d in all Countries.

‘ In the first place, all good Philosophers and Naturalists must
 ‘ agree that the *Root* consists of a quite different Substance from
 ‘ the *Stock*, so that the *Stock* is not a Continuation of the *Root*,
 ‘ as most People believe, but is in its self (and especially in its
 ‘ little *Bud* or *Shoot*, as shall be proved in its place) a distinct
 ‘ Being, tho’ ’tis united by so strict a natural Band, that
 ‘ it seems as if the *Root* and the *Stock* were one Substance.

‘ 2. It is also certain, that the *Roots* both great and small at-
 ‘ tract from the Earth the nourishing *Juices*, which (after they
 ‘ have digested them) they communicate to the superior Parts of
 ‘ the *Tree*.

‘ 3. ’Tis an undeniable Truth, that the little *Roots* are com-
 ‘ pos’d of the same Parts as the great, and exercise the same
 ‘ Function or Office, and have the same Advantage of attracting
 ‘ the *Juices* in proportion to their Bigness.

‘ 4. ’Tis well known that the *Stock* above the *Root* consists of
 ‘ small *Fibres*, *Glands*, *Lymphatick Vessels*, and Passages for the
 ‘ *Juices*.

‘ *Juices*, by which it receives the *Sap* from the *Roots*, and con-
 ‘ veys it afterwards to the other Parts.

‘ 5. Experience also shews us, that the *Root* produces a *Callus*,
 ‘ and that being wounded, it recovers as well as any other part
 ‘ of the *Tree*.

‘ 6. ’Tis allow’d, that from Autumn to *March* the greatest
 ‘ part of the *Sap* is in the *Root*, and some of it in the *Branches*;
 ‘ but when the *Tree* begins to shoot, the Virtue is not so great
 ‘ in the *Root* and *Stock*, but is then chiefly in the *Leaves*, the
 ‘ *Blossoms* and *Fruit*. Divers other Reasons might be alledg’d.

‘ From these Propositions there results this true Conclu-
 ‘ sion: Whoever grafts, according to Art, fresh and sappy *Roots*
 ‘ under the *Stocks*, the greater and lesser *Branches*, the *Buds*,
 ‘ *Shoots* and *Leaves* of *Trees*, and covers the Place of the Con-
 ‘ junction with *Mummy*, so as that the *Stocks* may be preserv’d
 ‘ from rotting in the Earth, the Wound cur’d, and the callous
 ‘ Matter soon produced, may with Certainty expect that the
 ‘ *Root* which attracts the nourishing *Juices* of the Earth, will
 ‘ communicate its Superfluity to the *Stock*, and that again to the
 ‘ other Parts of the *Tree*; so that it must necessarily follow, that
 ‘ the *Stock* which is above the *Root* will shoot, flower, and bear
 ‘ *Fruit*, which is what was to be shewn.

Of the PRACTICE.

‘ As no manual Operation can be perform’d without Instru-
 ‘ ments, this Work also requires its particular Tools, as Spades,
 ‘ Mattocks, Saws, great and small Hedging-Bills, Chizels, a
 ‘ Mallet, large and small Knives, Wedges of several sorts pro-
 ‘ per for *Trees* in a Forest; a Vice for the *Stocks* of large *Fruit-*
 ‘ *trees*, and proper also for the *Woods*; a Pair of Compasses of
 ‘ a new Invention; round Sticks to draw any thing to one; Fire
 ‘ and Light, and the vegetable *Mummy*.

In-

Instructions for the Practice of a Multiplication of all exotick Trees and Shrubs.

‘ The chief Maxim concerning exotick *Plants* is this, that
‘ you must not do any thing to ’em but in Spring, *viz.* in the
‘ end of *April*, or beginning of *May*; though we do not ex-
‘ clude the following Months, if they can be treated as they
‘ ought to be: For Example: If any one has a mind to make
‘ perfect *Trees* of the *Leaves*, *Shoots*, *Twigs* and *Branches* of O-
‘ range, *Citron*, *Laurel*, *Pomegranate Trees*, &c. and is wil-
‘ ling to hazard the whole *Tree*, he goes to work in the follow-
‘ ing manner.

‘ 1. He cuts off the *Stock* near the *Root*; then he cleans the
‘ *Root*, and cuts it in pieces, the biggest of which serve for the
‘ largest *Branches*; the midling for well grown Boughs; the small
‘ for the *Shoots*; and the least of all for the *Leaves*. But notice
‘ must be taken, that if a *Root* be very long, it must be cut into
‘ three, four, or more Pieces, as its Nature will best permit:
‘ but the Incision must be always well cover’d at bottom with
‘ *Mummy*.

‘ 2. When he has thus prepar’d the *Root*, he takes the *Stock*
‘ or *Branch* which he would cultivate, and cuts it inward; then
‘ he makes an Incision in the *Root*, and graffs it on; and that
‘ it may not fall off from the *Branch*, he ties it well with *Bass*;
‘ then he heats the *Mummy* a little over a Candle, and plai-
‘ sters over the Incision and Ligature with it. In this manner
‘ the *Stock* or *Branch* has its *Root*, and the *Root* being plant-
‘ ed in the Earth attracts the nutritive *Juice*, whereby the *Graff*
‘ begins to recover and to sprout out, and arrives at length to Per-
‘ fection.

Necessary

Necessary Observations.

‘ 1. When you have such a quantity of *Roots* as you cannot
 ‘ easily graff in a Day, put them in a dry Pit, and keep ’em from
 ‘ the Air. When the *Tree* has as aforesaid gotten an artificial
 ‘ *Root*, and cannot immediately be transplanted to its design’d
 ‘ Place, it must in the mean time be set in the Earth, that the
 ‘ Air may not hurt it, either by Cold or Heat.

‘ 2. Be careful in using the *Mummy*, that you do not apply
 ‘ it too hot, for then it becomes clammy, and may be drawn
 ‘ like Thread; ’tis best to heat it but a little, but Practice will
 ‘ instruct you best in the Use of it.

‘ 3. When you smooth the *Stock* at bottom, take care not to
 ‘ hurt the *Pith*, which would be follow’d either by a Putrefaction
 ‘ or Heat in the *Tree*; the Part which enters the *Root* ought to
 ‘ be pretty thin, that so the Union may be the sooner made.

‘ The chief Point is to fit the *Root* to the *Stem* exactly, so that
 ‘ the *Sap* which rises from the *Root* may enter the *Tree*; and
 ‘ that which falls down from the *Tree* may return into the *Root*,
 ‘ by which Communication of the *Juices* the *Tree* will soon attain
 ‘ its perfect Growth.

‘ 5. You must also mind to keep your Instruments as well for
 ‘ cutting, as for sawing and hewing, clean and free from Rust;
 ‘ for the Rust of Iron is very prejudicial to *Plants*.

‘ Question 1. *What must be done when we are not willing to*
 ‘ *hazard the Tree?*

‘ You may then cut as many of the great and small *Branches*
 ‘ as the *Tree* can spare, and as many of the *Roots* as possible,
 ‘ but do not touch the main *Root*, for then the *Tree* would die.

Question

‘ Question 2. *What must be done when an Orange or Citron-
‘ tree has absolutely no Roots, and one can get none of the same
‘ sort, wild or cultivated?*

‘ Then choose such *Trees* as have an Analogy with them, as
‘ the *Laurel*, &c. which are to be found every where, take their
‘ *Roots*, and graff them with *Citron Stocks*; but in case you can’t
‘ get these, you may make use of *Quince-Roots*, or *Plumb* or
‘ *Cherry-Roots*, and graff the *Stocks* with them; this way not
‘ only succeeds very well, but they last a long time, and the *Fruit*
‘ acquires an admirable Relish. Practice will inspire the Curious
‘ with useful Thoughts; and I shall say no more of it for the pre-
‘ sent, for fear of being too prolix. It is enough that there is a
‘ good and solid Foundation whereon to build.

‘ *How to prepare the noble Mummy for exotick Plants.*

‘ Take a quarter of a Pound of *Gum-copal*, (the Dissolution
‘ of which has been hitherto a Secret) beat it very fine, and
‘ searce it; take also a Pound and half of *Venice Turpentine*, melt
‘ it over a slow Fire in a strong earthen Pot; the *Turpentine* be-
‘ ing melted and liquidated, throw the sifted Gum into it, and
‘ stir it continually with a little Stick, and augmenting the Fire
‘ by degrees, it will dissolve insensibly; afterwards let the *Tur-
‘ pentine* evaporate well, and it will thicken; and when it is of
‘ a sufficient Consistence, you may make it up into little Rolls
‘ like Sealing-Wax, and keep it for use.

Necessary Observations in making this Mummy.

‘ 1. First, you must be careful of the Fire, that no harm may
‘ come to the House; wherefore it is better to make it in the o-
‘ pen Air.

‘ 2. You must have a Cover in your Hand, that you may ex-
‘ tinguish the Flame, in case the *Turpentine* takes Fire. I have

‘ often set Fire to it on purpose, and have stirred it about till I
 ‘ almost quenched the Flame, by which means it was sooner
 ‘ brought to a Consistence, tho’ at the same time it turn’d it
 ‘ black, which yet was no Prejudice to it; on the contrary, it
 ‘ has been of more Use to me on some Occasions, than if it had
 ‘ been clear.

‘ The wonderful Virtue and Use of this *Mummy* consists chief-
 ‘ ly herein. First, It is an excellent Vulnerary; for it is subject
 ‘ to no Corruption, as other gummy things are; and it hinders
 ‘ any Rottenness between the *Stock* and the *Root*, by which means
 ‘ the *Callus* is soon form’d, and spreads over all the Parts, and
 ‘ the *Stock* becomes entirely connected with the *Root*. In the
 ‘ second place it gives Strength and Vigour to the *Root*, and fa-
 ‘ cilitates its Growth.

II. *Concerning Fruit-Trees.*

‘ 1. As to the Operation or Incision, it is perform’d as was
 ‘ before said when we treated of *Orange-trees*.

‘ 2. You may likewise make the Conjunction and Ligature as
 ‘ well on the small *Stocks*, as the midling ones with Bafs: but
 ‘ when the *Stocks* or *Roots* are too thick, so that they cannot be
 ‘ well bound with Bafs, you may take platted *Straw*, or *Twigs* of
 ‘ *Osier*, and bind them together, and afterward tie them with
 ‘ Bafs.

‘ 3. The Incision must be dress’d with another kind of *Mum-*
 ‘ *my*, and then they must be set in the Earth.

‘ *How to make the Garden or Forest Mummy, which is very use-*
 ‘ *ful for ordinary Fruit-trees, as also for other Trees in the*
 ‘ *Woods.*

‘ Take a Pound and half of common *Turpentine*, and two
 ‘ Pounds of common Pitch; and when the *Turpentine* is melted
 ‘ in a Pot over the Fire, as has been said of the *noble Mummy*,
 ‘ throw

‘ throw in the Pitch beaten to a fine Powder, and when they are
 ‘ well mix’d together, and the Composition is grown pretty thick,
 ‘ take it off, and keep it for Use.

‘ Note, You may make little Sticks of this Mixture like those of
 ‘ Sealing-Wax, to be made use of on little *Trees*; or you may keep
 ‘ it in a Pot or Dish, and when you have occasion, melt it over a
 ‘ slow Fire, and dipping a little Brush in it, plaister the *Graff*
 ‘ with it, as has been already directed.

Divers Observations.

‘ 1. You must have a great Regard to the Season when it con-
 ‘ cerns *Fruit-trees*, especially large *Branches* and *Shrubs*; the best
 ‘ time is in the Months of *October*, *November* and *December*, be-
 ‘ cause at that Season Nature operates most vigorously in the
 ‘ Earth. It may likewise do well in *February*, *March* and *April*;
 ‘ but the Success is more uncertain, because of the Heat, and the
 ‘ rising of the *Sap*.

‘ 2. If you desire to have a great many *Apple* or *Pear-trees*,
 ‘ and have not enough *Roots* of cultivated *Trees*, you may very
 ‘ well make use of wild *Apple*, *Pear*, or *Quince-Roots*, taken
 ‘ from the *Woods*, and they will produce good *Fruit*; and, in
 ‘ case of Necessity, you may take *Roots* from common *Trees* of
 ‘ the *Woods*, such as the *Maple*, the *Ash*, or *Firr*. Or when
 ‘ you have no *Apricot* or *Peach-Roots*, you may take instead of
 ‘ them the *Roots* of *Plumb*, *Cherry*, or *Service-trees*, and graff
 ‘ the *Stocks* on them.

‘ *Chestnut-Stocks* will be best grafted on the *Roots* of the *Oak* or
 ‘ *Firr*; *Mulberry-Trees* on large *Walnut-Roots*; *Filberd-Trees* on
 ‘ the same; and *Apple-Trees* on the *Roots* of the white *Thorn*.
 ‘ In short, every intelligent Person will know how to suit them
 ‘ himself, provided he takes delight in it.

‘ 3. I have thought it proper to make a Draught of the Instru-
 ‘ ments, and particularly the Vice for large *Trees*; but any one

‘ may make them according to his Fancy; he must only take
 ‘ an especial Care that the *Stock* may not be hurt by the Vice; to
 ‘ this end it is best to cover it with Linnen. I have for some
 ‘ time made use of a Joyner’s Vice, which is very good for the
 ‘ purpose.

III. *Concerning the Trees of the Woods*

‘ They who desire to plant a *Wood*, should have a Busquet for
 ‘ the purpose. They may lop off the large *Branches* of any *Trees*
 ‘ in Autumn, after the Fall of the *Leaf*, and keep them in some
 ‘ place where they may be shelter’d from Cold, Rain, and the
 ‘ Heat of the Sun; then they may take up some, and cutting off
 ‘ the larger *Roots*, make a just Assortment, so as that every one
 ‘ may suit with the *Stock* or *Branch* that is to be grafted on it.
 ‘ They may also, without Prejudice to the *Trees*, cut away such
 ‘ large *Roots* as run above the Ground; for if the main *Root* be
 ‘ spar’d, no harm can be done. In the Months of *February*,
 ‘ *March* and *April* this succeeds well, there being nothing but
 ‘ the Heat of the Sun to give any Trouble; but Practice will be
 ‘ the best Instructor.

‘ When you have a quantity of *Roots* ready, which you can-
 ‘ not use immediately, put them in the Ground that they may
 ‘ keep fresh. You may even employ the *Roots* of *Trees* that have
 ‘ been a long time felled, provided they retain sufficient Moi-
 ‘ sture.

OPERATION.

‘ The Incision in the *Root*, and the preparing of the *Branch*
 ‘ or *Stock*, is done in the same manner as that of *Citron* or *Pear-*
 ‘ *trees*. As to the *Ligature*, it may be made not only with Bals
 ‘ and Pack-thread, but with Ropes of Straw, or twisted Osiers,
 ‘ to keep the *Stem* firm, but the Stick is to be fast’ned to the
 ‘ *Stem* with Bals or the like; then you must take the *Garden*
Mummy;

‘ *Mummy*; or if you have a mind to be sparing, you may buy
 ‘ the worst of *Pitch* and the cheapest of *Turpentine*, with which
 ‘ you may dress the *Joint* of the *Graff*; but you must take care
 ‘ not to apply it too hot, which would damage the *Root*, the
 ‘ *Stock*, and the *Juices*, and hinder the growth of the *Tree*; it
 ‘ is best to stay till it is pretty cool, and in the mean time to dress
 ‘ it above the *Root* till the Heat is moderated a little.

‘ As to the Instruments, the common *Garden-Knives* are most
 ‘ proper, as also the larger sort of Chizels. How the Vice is to
 ‘ be us’d, will be best learn’d by Practice.

‘ I have only a Word to say concerning my new-invented
 ‘ Compasses. Since I have often said that the principal Art con-
 ‘ sists in exactly fitting and adjusting one to the other, as also in
 ‘ making the *Incision* clean and smooth, and binding it well, the
 ‘ *Mummy* not being apply’d too hot, and since it is very difficult
 ‘ to reduce the Sides, especially of large *Stocks*, to an Equality,
 ‘ you may usefully employ these new Compasses in the following
 ‘ manner. Strike one of the points deep into the middle of the
 ‘ *Stock*, and according as you would make your *Incision* great or
 ‘ small, mark the *Stock* with the other point in a circular Figure,
 ‘ and then work according to that Mark.

‘ *Note*, That in making the *Forest-Mummy* you must take care
 ‘ that the *Turpentine* may evaporate as before.

Second SECRET.

*How from all the Leaves, Buds, Shoots, and Branches (of
 which there are Millions on all Trees and Shrubs) to form so
 many Trees in two, three, or at latest four Months, so as
 that the Roots may hang down of themselves and Germinate.*

‘ This is the easiest Operation that ever was invented, and is
 ‘ thus perform’d. Make a Transverse-Incision in the *Foot-Stalk*
 ‘ of the *Leaf*, but not too long or too deep, for then you labour
 ‘ in

‘ in vain; put a little Cotton into it, and cover it with *Graffing-*
 ‘ *Wax*. The *Stocks* and *Branches* are to be treated in the same
 ‘ manner, but you must take care not to cut too deep into them,
 ‘ for then the Wind would break them off. In large *Stocks* you
 ‘ may make twenty or more *Incisions*. The time for this is in
 ‘ the Months of *March*, *April*, &c. But when the *Sap*
 ‘ rises plentifully in the *Stocks*, it must be discontinued. The
 ‘ best Season is in *June* or *July*, and then it will produce
 ‘ Wonders.

‘ When the Callous Matter appears and thrusts off the Wax,
 ‘ it increases more and more till you perceive the point of the
 ‘ *Root*.

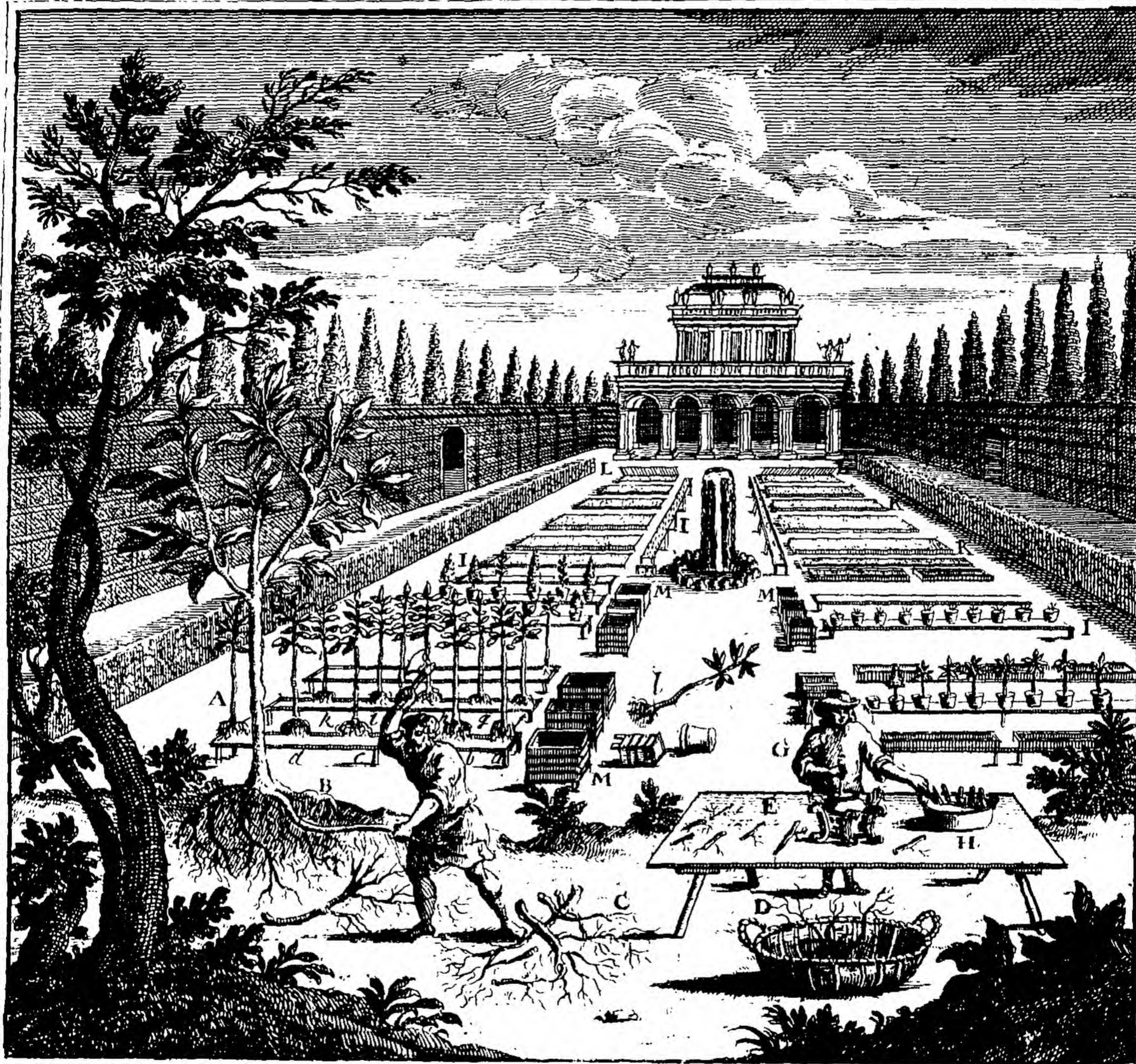
‘ That this may the sooner happen, anoint the Parts often
 ‘ with the following Unguent, then you will see the Substance of
 ‘ the *Root*, which forms itself more perfectly when set in the
 ‘ Earth.

‘ Take two Ounces of *Venice-Turpentine*, three Yolks of Eggs,
 ‘ a quarter of an Ounce of *Mastic*, a quarter of an Ounce of
 ‘ *Myrrh*, a quarter of an Ounce of *Frankincense*, and make an
 ‘ Ointment which I call the *Nutritive Ointment*. When the *Stock*,
 ‘ *Branch*, *Bud*, or *Leaf* has its perfect *Callus*, cut it off and
 ‘ dress it with *Mummy*; then the *Callus* will shoot out the *Roots*
 ‘ it inclos’d, which, tho’ they till then, were there only mate-
 ‘ rially, will afterwards shew themselves formally to Satisfaction.

‘ But since this often proceeds very slowly, the surest way is to
 ‘ take those *Roots* which have already a *Callus* at bottom, and
 ‘ *Graff* them into the *Incision* in the aforementioned manner, and
 ‘ tye them as above; then they will not fail to Shoot, Blossom,
 ‘ and bear Fruit.

§ 26. These were my first Thoughts concerning an *universal*
Propagation, which I was forced to communicate to some who
 earnestly desir’d it, before I had time to let them ripen, or to
 examine the matter more nicely. Nevertheless I assured the Cu-

rious



rious, that if the Affair did not answer in all Places, I would do my best to fathom the Reason of it, till I should find wherewith to satisfy 'em for the Money they trusted in my Hands. Now since I positively declared in my Proem, that if contrary to my expectation I should be out of the way, I would upon notice of it apply myself to such as might rectify my Mistake: And since for the above-mentioned Reasons I am assured that this Art of *Grafting in the Root* ought to be look'd upon only as a particular *Multiplication*, and not as *universal*, I shall leave it where it is, and pass to my last Proposition,

Of a particular manner of Grafting the Root.

This manner is indeed but seldom seen, but they who will undertake it according to the 15th Plate, may chuse the *Incision* denoted by the Figure (H.) and Graft eight or nine *Stocks* or more upon one *Root*, in the manner I have described, and they will not fail of a great deal of Content.

Here I end my particular Experiments of a general Propagation, and go on to describe my last Proposition in all its Circumstances.

P L A T E XVII.

The manner of Cultivating exotic Trees and Shrubs, by cutting their Roots to pieces.

(A.) Represents a *Frame* with several exotic Trees (from a. to l.) which have been taken out of their Boxes.

(B.) A large Orange-Tree not transplanted in many Years, which having too many Roots, the Gardener cut off some of the large ones to divide them and cultivate them by means of the Mummy.

(C.) The Roots, of which every sort is set apart, though the Roots of Orange and Citron-Trees may mix well enough together, for

for tho' they should be cut and planted together, it would be no prejudice to them.

(D.) *A Basket in which the Roots of one and t^other sort of Foreign Trees are set apart.*

(E.) *Roots of Orange and Citron-Trees cut into bits of the length of ones Finger, and made smooth at both Ends.*

(F.) *The Chaffing-dish with the noble Mummy. Formerly I made use of Gum-Copal, but as that is very dear at present, one may employ in its stead the best Virgin-Pitch, and a little white Wax; if one mixes a little Aloes amongst it, it will be so much the better, and will be a Preservative against Vermine.*

(G.) *The Gardener dipping the Ends of the Roots in the Mummy, and afterwards laying them in clean Water, that the Air may not dry them before they can be planted.*

(H.) *The little Tub with fresh Water, in which the Roots are put after being dress'd with Mummy, that they may harden and cool the sooner, and that the heat of the Mummy may not hurt ^{'em}.*

(I.) *The Pots and Cases in which the Roots are planted, the top of them appearing a little out of the Earth.*

(K.) *Prepar'd Beds in which several of the aforesaid Roots are planted.*

(L.) *Cover'd Beds to save the Roots from too much heat or wet.*

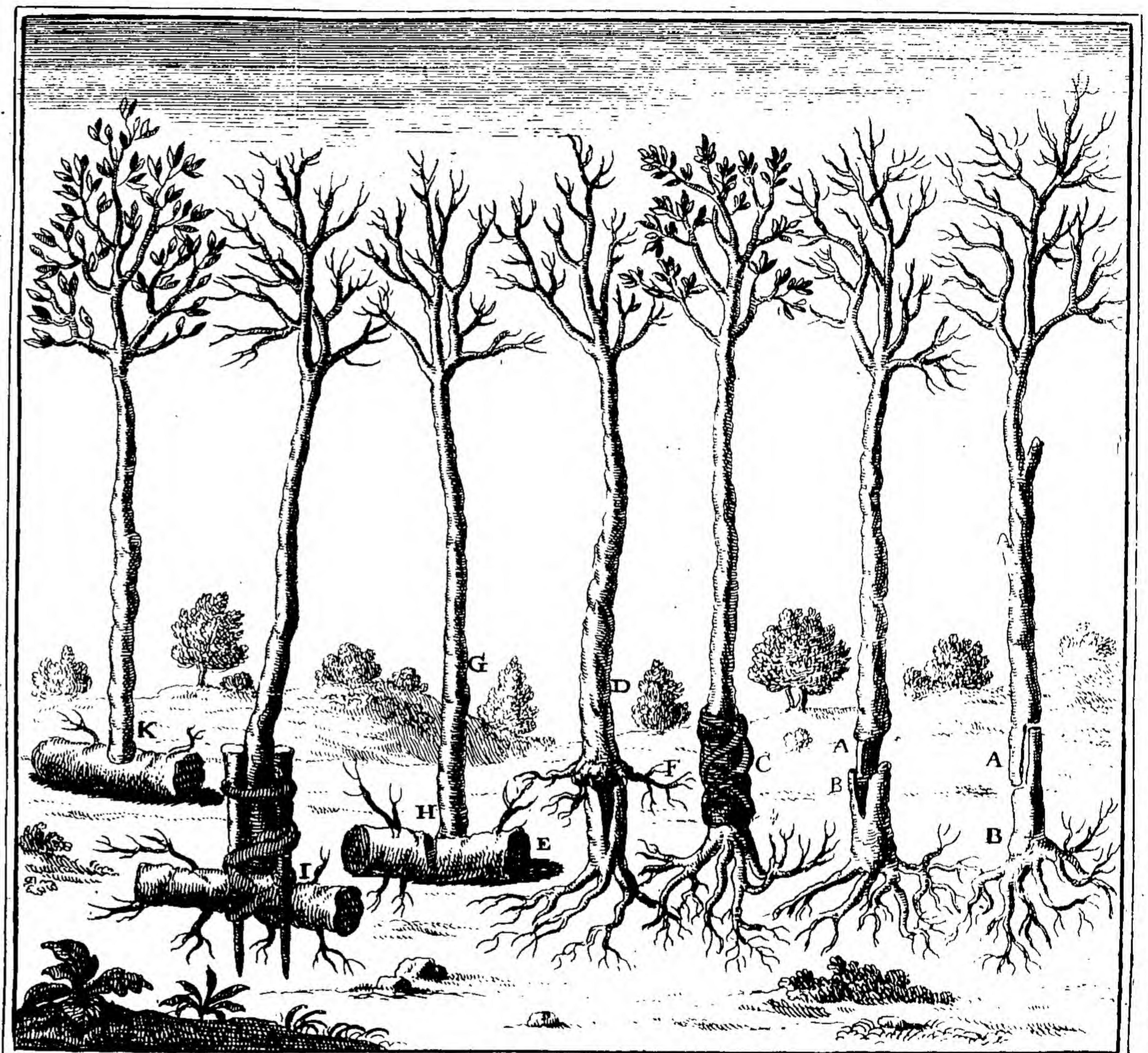
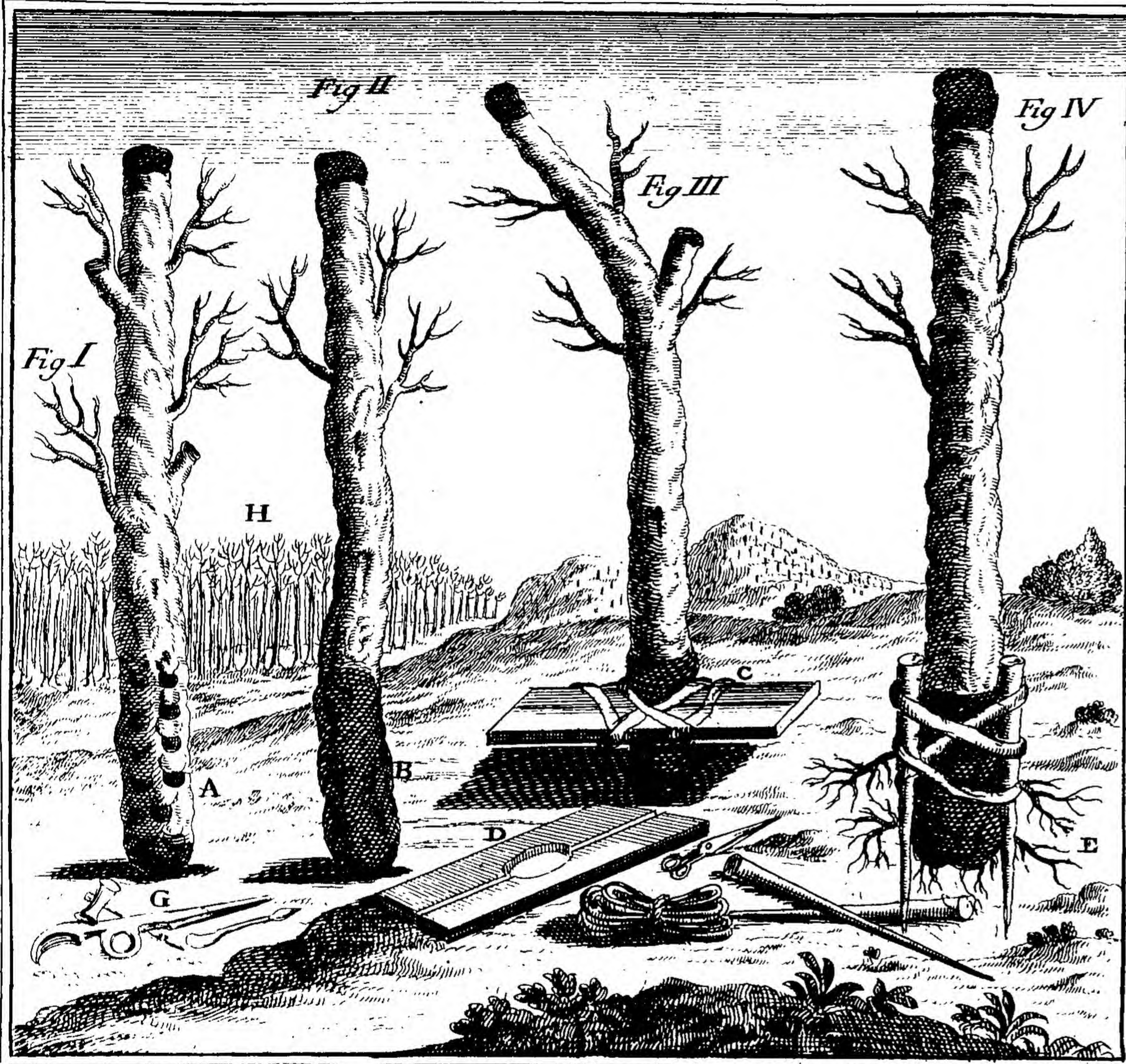
(M. M.) *The Boxes from which the Trees were taken, and in which they are replanted after being depriv'd of their superfluous Roots.*

P L A T E XVIII.

Which shews how vacant Forests and Woods, which have been cut down, may be replanted by the Roots, extirpated, and dress'd with Mummy according to Art.

(A.) *A place where Trees have been felled, and where there are only Stumps with Roots, which are to be extirpated. As it is pretty*





pretty well known that the Roots of Trees in Woods don't enter deep into the Earth, but extend themselves chiefly in breadth, and that the properest Roots for this Use are those which are nearest the Stock, as being the largest; therefore in case the main Root cannot be got out, we need only dress it with Mummy, and content ourselves with the others, which will be sufficient to raise new Forests.

(B.) A long and thick Root which is saw'd into many Pieces before it is put into the Root-bench.

(C.) Represents the use of the Root-bench described in the First Part.

(D.) How the piece of Root is placed in the Root-bench, which the Forester makes even at both Ends with a Knife; but Care must be taken as well in this as in sawing the Root, not to hurt the Bark, which if bruised would hinder the sprouting in that Place. When the Roots have been polish'd, they must be dress'd with Mummy.

(E.) The Copper-Kettle in which the Mummy is melted, and into which the Roots must not be dipped as long as there is any Smoak.

(F.) The prepared Roots.

(G.) The Trenches for the great Roots.

(H.) The great Roots order'd with Mummy; how they are planted and appear a little out of the Earth.

(I.) Is a piece of Land design'd for a Forest, wherein a great number of these prepar'd Roots are planted.

P L A T E XIX.

How the great Roots are prepared by the Graffing-Chizel, and dress'd with Mummy.

Though we have shewn both clearly and fully in the 12th Plate how to use the *Graffing-Chizel*, yet there have been some

H h

who

who could not understand it, because it was only represented in little, therefore I have thought fit to shew it here more largely and distinctly.

Fig. 1. *Represents the Stock with the callous Knots made by the Graffing-Chizel, which afterwards shoot out as in (A.)*

Fig. 2. *The Stock or Branch with the Knots or Root-points cover'd with Mummy as in (B.)*

Fig. 3. *Shews the manner of binding the Prop (C.) to the Trunk or Stem, so as that it may stand firm in the Earth, and not be shaken by any outward Violence. The Prop may be tied with Bass, Straw, Pack-thread, or Osiers, as shall be judged proper.*

Fig. 4. *A great Branch or Stem which shot, and which by its Vigour broke the Mummy that lay upon the Callous Matter, from which Roots proceeded, as (E. E.) Here are several Tools, chiefly the great Graffing-Chizel, together with the Mallet, as (G.)*

The Letter (H.) shews us a new Wood or Plantation, thus manag'd after our Method, which has a very good Effect.

It will be no small Satisfaction also to observe the great Branches or Trunks when they begin to shoot, and how vigorously they proceed in their Growth.

P L A T E XX.

Which shews once more how to graff upon the Root after a particular manner, and proves that such an Operation is not impossible, as some imagine.

(a. a.) Two thick and high Branches graffed on the Root (b. b.) by Incisions, one of which representing the noble Incision, as appears by Tab. 13. grows the first and the best, therefore this Incision is not only very useful, but also requisite for such an Operation.

*(C.) Represents the manner of Dressing, which must be only
with*

with soft Mummy, which is spread over like a Plaister, so as that the over-flowing Liquor may have a little Air, and the Trunk may not be choak'd, either within or near the Root.

(D.) Describes a long Branch united by the Callus to the Root, as in the Figure; for from the bottom of the Incision the callous Matter spread itself round in the form of a Ring, as shews (E.) it was also seen to come out above at the Joint, and uniting it filled up the hollow of the Incision so that it could no more be seen in the Branch; from the upper Callus came out small Roots, agreeably to Fig. E. Therefore I can't enough admire the Impudence of a certain Gardiner, who said that I had fail'd in this Operation as well as other People; whereas I can evidence the contrary as well as to myself as others, and something of it may be exposed to view if desired, as has already been done, and as Tab. 16. plainly shews; and when in process of time we have gone through this Work, we shall be very willing to acquaint every one with our Discoveries.

(G.) This Figure is a Representation of the best way of grafting on Roots, mentioned in Tab. 15. at (H.) and set here in a better light, shewing how this Root was taken from the Principal Root. (I.) shews how the Work is secured with Ligatures and Props; (k.) shews the Union of both Root and Branch.

Whoever shall go to work after this manner, and Graff a Branch on a Root cut length-wise, and having dress'd it, shall lay it under Ground, will do very well too, and the Branches will grow to a wonder.

C H A P. II.

Containing a Proposition that may be look'd upon as the best, the surest, and at the same time the most easy Method for the universal Multiplication of almost all Vegetables. ☉

§ I. **H**AVING given the Title of *Universal* to my *Multiplication*, it is fit I should inform the Reader that this may be understood two ways; first, in a collective Sense, in which Sense an *Universal Multiplication* of all *Trees* and *Shrubs* cannot be performed by a single Method; secondly, distributively, which latter Sense obtains here, and imports that this single manner of *Multiplying* an hundred thousand times may be indifferently used, with respect to any *Trees* and *Shrubs*; tho' this it seems appears incredible to several People, so far that a Query was once proposed in an Assembly, viz. *An detur modus artificialis universalis multiplicandi arbores & frutices distributive sumptos?* Whether there be such a thing as an *universal* way of *multiplying Trees* and *Shrubs* in a distributive Sense? There was one who presently answer'd, That such a thing might be reckon'd among the *Non entia*, and was such another Fiction as that of *Bellerophon*; but I hope I shall through care and diligence bring the matter so far as to convince those Incredulous Persons, not by Words only, but by real Experiments. In order to gain those People, I shall set before them the following four Maxims or Rules, which are applicable to the *Multiplication* of all *Trees* and *Shrubs*, as being very positive no body who considers them will dislike my new artificial way of an *Universal Multiplication*.

First

First Rule. What is found in one, is to be found in all.

Second Rule. What is said of one, is said of all.

Third Rule. What is done to one, must be done to all.

Fourth Rule. What is the Effect of one, is the Effect of all.

If these *Universal Propositions* may be applied to my Undertaking, I hope I shall thereby perform what so many curious People have so much long'd for.

§ 2. I shall briefly repeat these general Maxims, and apply them to *Trees* and *Shrubs*.

The First is, *What is found in one, is to be found in all.* We say of every *Tree*, that there is Life in it; from whence we necessarily conclude, that there is in it something substantial that is the Spring of such a Life; and the same Conclusion may be drawn from its contrary, *viz.* Death. For when we say of a *Tree*, that it is dried up and dead, the Conclusion is no less true and certain. Now since it may be said of one *Tree*, that there is Life in it, 'tis a necessary Consequence that we may say of all, that they have a Spring of Life, or a living Substance within themselves.

Secondly, Every *Tree* has a Body with its proper Organs so or so modified, on which the vegetative Soul acts; tho' as to the outward Form, one is very different from another, yet as to the Inside every *Tree* is composed of aqueous, terrestrial, saline, bituminous and balsamick Parts; as one *Tree* is made up of such Parts, so are all the others; these Elements are found in all *Trees* and *Shrubs*, tho' one Element may bear the Sway in one more than in another, as has been long ago demonstrated from the Principles of *Chymistry*.

Second Rule: What is said of one, is said of all. I am positive no Body can name or shew, either a *Tree* or a *Shrub*, three, four, or five Years old, not to say nine, fifteen, twenty and upwards, but it will have some small *Joints*, *Shoots*, or *Tokens* to distinguish its Age. Tho' some are pleased to give out that no such thing

thing is to be found in *Palm-trees*, *Cedars*, *Lappus*, *Caranna*, *Sanguis Draconis*, &c. 'tis however very certain; and we need only peruse the Chamber of Rarities both of Nature and Art, of Dr. *Valentin*, and the fine Cuts we meet with will soon give us Satisfaction. But tho' it could not be demonstrated from thence, yet common Sense and Reason would yield sufficient Conviction: For the *Branch* that shoots in the Summer must stop when Winter comes; therefore at the End of every Season it shuts it self up, as may easily be seen both in *Trees* and *Shrubs*. Next Year, when it shoots again it leaves another Mark; and so from Year to Year, as may be observed in all *Trees* and *Shrubs*; for if I can in any *Tree* see all the *Joints* Year by Year, I may say the same of all *Trees*; which will remain unquestionable, till any Body shall prove the contrary. 'Tis objected, that *Aloes*, *Jucca gloriosa*, and other *Plants*, grow every Year without making *Joints*. To which I answer, That as yet we have said nothing of those *Plants* that have only *Leaves*, but of those that have *Trunks*, *Branches* and *Twigs*, &c. but let any Body take an *Aloe-Leaf*, and cut it off as Art directs, and I don't question, but being well done up with *Mummy*, it will take the *Root* as well as an *Opuntia-Leaf*. All *Plants* are nevertheless excepted, which sprout again every Year without standing out the Winter.

Third Rule. *What is done to one, must be done to all.* It has been already demonstrated, that every *Tree* is furnished with a-bundance of *Joints*, in which lies the Spring of Life. You may take a *Branch* with two or three *Joints*, and cut off the *Wood* at the bottom of each, according to Art, which being done, you may dress and lay them under Ground: But as there are on every *Branch* above fifty or threescore *Joints*, which may all be treated after this manner, as the following Table shews; it follows that the same Method may be us'd with respect to all *Trees* and *Shrubs*, tho' they have a hundred thousand or a million of *Joints*.

Fourth Rule. *What is the Effect of one, is the Effect of all.* 'Tis certain, from a great many Experiments, that a yearly *Joint* or *Shoot*, has in it self at the same time both *Root* and *Branches*; and, according as things are manag'd, it quickly produces either a *Twig*, or a *Root*. To demonstrate this, I shall pitch upon an Instance known to all Country People and *Vine-dressers*; they take a long *Stalk* or *Branch* of *Vine* that has a great many *Joints*, which they bend under Ground, and it shoots a great Number of *Roots* on every side; now had they not bent that *Branch* thus under Ground, other new *Branches* would have come out of its *Joints*, which is not at all to be questioned; but if *Roots* may grow from *one Shoot* or *Branch*, they may likewise grow from *all*, when skilfully prepared, as Experience has shewn, and new Discoveries will confirm. Therefore what has been said of *One Shoot* will be found true of *All*.

§ 3. Before I give a clear and plain Description of the cutting *Joints* or *Shoots* of a *Branch*, I will first determine what is properly to be understood by a *Shoot* or *Joint* of a *Tree* or *Shrub*, which may be thus defin'd, *viz.* a *Shoot* or *Joint* is a certain Portion of the *Tree*, which Nature was at work on all the Year, till it came to its perfect Growth, and in which are found all the most essential Parts of the *Tree*: Whereas a *Shoot* or *Joint* is called a Portion of the *Tree*, some may be apt to think it is a whole *Branch*, but I only mean by it the Space between two Separations or Rings that are seen upon a *Branch*, as is set in a better Light in the following Table. Moreover, we have said that Nature works a whole Year before it has its full Growth. Some say Nature often produces two *Shoots* in one Year upon a *Tree*, which I don't entirely oppose; but such a thing does not happen every Year, 'tis only when Seasons have proved bad, or when perhaps some Vermin has gnawed off the first *Shoots* or *Joints* of the smallest *Branches*, in which case Nature tries its Strength a second time, and you see those *Branches* grow anew to-
wards

wards Midsummer, and shoot till pretty far in Autumn; and then they stop till Spring, when they begin to bud again and shoot new *Joints*, which are parted again with new Ringlets. We have also said that the essential Parts are there included, which being a Truth, as has been sufficiently shewn, I shall only refer the Reader to what was said before.

§ 4. If any Body wants to be inform'd how I fell upon the Thought of cutting *Shoots* or *Joints*, and dressing them with *Mummy*, he may know, that when some Years ago I apply'd my self to the reverse way of Planting, as Tab. 8. Part I. shews, I did my best to graff on a long *Trunk* that was grown very streight, a quantity of *Branches* the reverse way, so as that they might all blossom that very Year or the next; but it was an easy matter for me to judge, that the first *Shoot* could not bring forth *Fruit-buds*, since according to the common way of Graffing, in Use among *Gardeners*, when only first *Shoots*, or those a Year old are graffed upon a wild *Trunk*, it often happens, that scarcely any *Blossoms* are seen in three, five, eight, nay ten Years, much less any *Fruit*. This made me observe the *Tree* once more with a great deal of Exactness, to find out where fruitful *Branches* might most easily be met with; by which Means I acquir'd the Skill of reckoning the Age of *Branches* to sixteen and eighteen Years. Having a while after observed in my *Garden*, among others, a little *Tree* very sound, and well grown, aged thirteen Years; I took notice, that on the long and chief *Trunk* there were seven *Joints* or Partitions, as so many Rings round the *Trunk*, and but only six on the biggest *Branches*; and adding these as so many Years together, I remembered I had graffed that *Tree* much about such a time; which Discovery thus shewing me how to reckon the Age of *Trees*, pleased me very much.

§ 4. Some while after this, as I was in a certain Monastery near this Town, walking with the Abbot in his fine *Orchard* full of *Fruit-trees*, and the *Joints* or Partitions that shew the Distinction

tion of the Years being very obvious to my Eyes, I said I would undertake to tell him the Age of every *Tree*: Upon which he led me to one that he had planted the very same Year he was preferr'd to his Dignity, but I knew not how long since. Being then willing to make a Master-piece of this, I exactly observ'd the longest *Branch*, and seeing fifteen yearly Partitions, I added six Years for the *Trunk*, and told him the *Tree* was one and twenty Years old: He answered, I had guessed one too little; to which I said, One was next to nothing. This was the Original of a thing, which no Body has yet minded to any purpose.

§ 5. After much Trouble, what I have mentioned above confirmed me in my Discovery, because I had good Reasons to think that by cutting off the *Shoots* or *Joints*, I could not fail of discovering the Art of multiplying all *Trees* and *Shrubs* to an almost infinite Degree. I shall therefore explain this Matter more fully, as being a true Proposition.

§ 6. To be as clear as possible, I'll endeavour plainly to set off the Matter by Tab. 21. One Day I caused a long thick *Bough* of an *Apple-tree* to be cut down, Fig. (L.) and took particular Delight in ordering it thus: (*A. A.*) was the Length of the *Bough*, upon which I told twelve *Joints* or Partitions. The longest *Branch* which was on it (*c. d.*) had eleven *Joints* in its length, and nineteen *Side-branches*. The *Branch* (*E.*) had twenty-five *Joints*; and the *Branch* (*G. H.*) had eleven. There were besides some small *Branches*, viz. one that had but three little *Joints*, and another with ten; so that there were in all upon that *Bough* ninety-nine *Joints*. Now if twenty such *Boughs* be put together, they make one thousand nine hundred and eighty *Joints*, that may yield as many *Trees*. It may be objected here that each *Joint* shoots forth but one *Bud*, and consequently that it's a long while before a *Tree* can proceed from it; and therefore this Discovery is of no greater Advantage than the

Seed way, or the inoculating a single *Bud*: To this I answer, That any Body may, if he pleases, cut his *Branch* into fewer *Joints*; he may, if he will, take all the *Branch* (*a. b.*), which is twelve Years old, and cut off from the Top the first and second *Joints*, together with all the *Side-branches*. He may also cut off the *Branch* (*c. d.*) as he did the two first *Joints*, and it will still remain as long as a *Branch* of nine Years old; and then is it not a great Advantage in one Year's time to make a *Tree* out of a *Branch*, which *Tree* is presently nine Years old, and has its proper Height and Strength? Thus every Body may make great and small *Trees* as he pleases, as Experience will sufficiently evince both as to wild and fruitful *Trees*.

§ 7. The Consideration of those little *Joints* might occasion a Query, *viz.* Whether it exactly happens every time to all *Trees* and *Shrubs*, that a *Branch*, which is ten Years old, must, within one certain Space, have just so many *Joints* or Marks? As for Example: In Space 10, 11, Fig. 1. which denotes as many Years, there is a *Branch* eleven Years old: Does this always happen thus every where? This can't be affirmed; for often, in the Space of eleven Years, a *Branch* may be found which has but four *Joints*, &c. It may be said in general, that on a *Branch*, which is as a Basis, there are no other *Branches* older than the Basis it self; for it is impossible that a *Branch* of the length of eleven Years should bear a *Branch* of fifteen or twenty; but indeed the number of Years may be equal, which falls out very frequently, but it never can exceed; neither can a *Trunk* of twelve Years old bring forth a *Branch* of fifteen or twenty; or if the former is but three Years old, the *Branch* that came out of it cannot be seven. But it is natural to find upon a *Trunk* of nine Years a *Branch* of one, two or three; because Nature, which will not be confin'd, but will work and act as she pleases, freely brings forth *Branches* here and there, some at one time, and some at another; but when Nature works according

to

to the common Course, 'twill be found as I have said. 'Tis also a thing worth notice, that upon great *Branches* there are very often little ones no longer than the Finger, tho' they be of the same Age with the great *Branch*; and their Years may be easily distinguished by the Number of *Joints* or Rings. Whoever questions it, let him split one of those little *Branches*, and he will find within it as many little *Joints* as the *Branch* has Years. This chiefly set me upon examining *Dwarf-trees*, which shall be purposely discoursed of in the 8th Chapter.

§ 8. Since all the *Twigs* upon the *Branch* (*a. b.* Fig. 1.) are represented as cut, I shall more fully explain the Meaning. Every Incision represents a *Joint* or a Year. But to the end I may be better understood, and it may be well apprehended how Incisions of one or several Years ought to be perform'd, the following Observations must be well consider'd: Take the *Branch* (*L. M.*) of ten Years old; if you will cut a *Joint* out on't, you must so cut it off, as to leave the severed Piece clos'd at the top and bottom, which is absolutely necessary; and every *Joint* being so cut off, as to be covered with the Ring of its Year, not one of them will die. I therefore proceed thus: At the Place marked N^o 10. I take off with my Knife the little bit (*N.*); and at N^o 9. above that *Joint* I take off also with the Knife the Piece (*O.*) and keep (*O. N.*) as a perfect *Joint*, and well cut: If at another time I have a mind to cut off a *Branch* with five *Joints*, or five Years old, I cut it first near N^o 8. taking the little Bit off with the Knife agreeably to the Incision (*P.*), and above it near N^o 3. where I cut it cross near (*Q.*) Thus every thing is right, as may be observed in the other Figures set here for that purpose, from one *Joint* to the length of ten. I'll end this Chapter concerning the Manner of cutting of the *Joints* according to their Age, with assuring the Publick, that as it is performed upon one *Branch*, so it may be upon all and every one in particular, as well of common *Trees* as Exoticks and wild ones.

TABLE XXI.

An universal Method of Multiplying by cutting off the Joints or Shoots, which can be performed upon all Trees and Shrubs in all Climates.

Fig. I. *A great and long Branch of an Apple-tree, very full of Twigs, upon which, by an exact Observation, the Joints or Years are easily perceived.*

(a. b.) *The length of the Branch, upon which are seen twelve Rings or Partitions that denote the Years, as you see by the Cyphers; those Pieces of the chief Branch are as Pedestals, to which the other Branches or Twigs are fastened, leaning and resting upon them, as you see N^o 10, 11. This Partition is often thus considered in the Text, since the Branch (C D.) leans on it, which is eleven Years old, and its Bud must needs have grown within the first Year, together with the first Shoot, which seldom happens; the Branch being for the most part younger by a Year than the great Branch from which it proceeded: however, this is not generally so neither, Nature continually sporting with her Productions, as we have already several times hinted.*

The following Joints were found upon this Branch: (a. b.) the main Branch or Trunk had twelve Joints, or was twelve Years old; that of (c. d.) eleven; the Side-branches nineteen; the Branch (E. F.) twenty-four; there were in all upon the Branch ninety seven Joints. Whoever now has a mind to raise a young Tree from each of those Joints, will gain so many young Trees; he that is desirous of larger Trees, must be content with proportionably fewer: As for Example: He may take the great Trunk (a. b.) and cutting off the Side-branches, he will have at the very first a Tree twelve Years old; or else he may take the Branch (C. D.), and taking off the Side-branches, he will have one eleven Years old, which is a great Advantage.

Fig.

Fig. 2. Explains the thing still better, since it describes all sorts of Branches, whose Ages are seen, the Side Branches being cut off. Those who after this manner will cut a Tree of a Year old, must cut it as in (Z.) Of two Years old, as in (Y.) Of three Years, as in (X.) Of four, as in (W.) &c. When they are planted, there must be at least the length of a Year under the Earth; but if the length of two or three can be spared it will be so much the better.

(L. M.) Describes more plainly how the Branches are to be order'd, to wit, every piece must be clos'd at top and bottom; as for Example; if you will cut a perfect Joint out, of the space you see at the Branch (L. M. Fig. 2.) you must cut off the piece (N. M.) near 10 as in (N.) and likewise near 9 as in (O.) then that Piece is a perfect Joint; you then take off the piece (O. P.) and from 8 to (Q.) are five perfect Joints well cut in the intermediate Space. To be short, the view of the Figure will set every thing in a truer light than all the Words in the World.

CHAP. III.

How after this manner all exotick Plants may be multiply'd, ad Indefinitum, made to grow by degrees, Blossom, and yield Fruit.

§ I. **E**Xotick Trees having been several times mentioned both in the first and this second Part, it is fit it should be known which Trees and Plants are of that number. The first Rank is claimed by Orange-Trees, Lemon-Trees, Citro-Lemon-Trees, and Adam's Apples. Next come in order, Aloes, Jucca gloriosa, Laurel-Trees, Cherry-Laurels, Pomgranats, Myrrh, Mastick, Cypress,

Cypress, Fig-Trees, Cedars, Cardamon, Olive-Trees, Judas's-Wood, Jujubas, Capers, wild and domestick Opuntia, Golden-Box, Agnus castus, Alcea Arborescens, Jessamin, Spanish-broom, Rosemary, Jericho-Roses, &c. In short, a whole Catalogue might be drawn up of fine Exotick *Plants*, especially their number daily increasing, as it does at the Country-Seats of all Persons of Quality.

Was I inclin'd to enlarge, the nature and properties of Exotick *Plants* would furnish sufficient Matter; I might shew how they have been till now multiply'd, either by Nature or by Art; and above all might describe the Culture of *Orange* and *Citron-Trees*; but so many learned Authors having treated of this Matter, I shall meddle with it no further than by borrowing the following Lines from a famous *Italian* named *Austin Mandirola*, a *Franciscan* Fryar, and Doctor in Divinity, who practis'd *Gardening* 30 Years, and at last wrote a Book in *Italian* of his own Discoveries and Experiments. The third Part of his Work treats of the manner how *Citron* and *Orange-Trees* may be cultivated and multiplied. He chiefly speaks of the way of raising *Citron-Trees* from the *Branches*. This (says he) is the *Italian* way. In *April*, when the Air begins to be mild and pleasant, they use to cleanse their *Orangeries*, (by which are signify'd the Conservatories of *Citron-Trees, Lemon, and Orange-Trees* of all sorts) then from the well-grown *Trunks* they cut off several streight and smooth *Branches*, not exceeding a Foot in length. From these they scrape off two or three Inches of the *Bark* at the bottom; they also cut off their *Tops*, and so lay them in well-dress'd Ground about four Inches deep, and a Foot or two distant from one another; if there be any single *Buds* they take them off, and are very careful of the *Branches* till they have taken *Root*, which happens if not to all, at least to some of them; they often make the Earth loose above for those that have taken *Root* and begin to shoot, and if the Weather be dry, they diligently water them; thus

thus *Citron-Trees*, and others of the like kind, will commonly yield *Fruits* the third Year; but *Lemon-Trees* and the like, not till the 5th. Those *Fruits* are excellent of themselves, there is no occasion for inoculating them; but as to *Orange-Trees*, that Father says they are excepted from this Rule, for their Wood being very hard, it is very seldom any of 'em take *Root*; therefore they must be rais'd either from the *Seed*, or (to gain time) inoculated upon *Adam's Apples*. This is seen more at large in Mr. *Elsaoltz's* Book of Gardening, pag. 240.

§ 2. M. *Van Hochberg*, in his *Curious Georgicks*, and Book VI. Chap. 36. p. 615. *Of the noble Country Life*, gives the following Description of the same Method. In the *Spring*, when the Cold is gone, and *Trees* are commonly pruned and freed from their luxuriant *Branches*, they cut off from the upper part of *Citron* and *Lemon-Trees* small streight and smooth *Twigs* about a Foot in length; the *Bark* of every one is taken off about two or three Fingers breadth with a Knife, and in the wane of the Moon they are laid in good fruitful Ground so deep as to leave out but two Fingers-breadth of the *Tops*, which are to shoot; or the *Bark* is only scrap'd away below about the breadth of two or three Fingers with a Knife, the *Tops* and *Buds* are cut off, and thus they are planted in good Ground four Fingers deep, and about two Foot distant from one another. As soon as they begin to shoot, (which is a sign of their having taken *Root*) the Earth is to be softly stirr'd up; they must be water'd every Evening, and Weeds ought to be destroy'd; this is the way to cause a more speedy growth than from the *Seed*. The best method is to plant them in Trenches. There is not always occasion for transplanting them, and sometimes they will grow better when they are left in the same place. Fair and calm Weather is requisite for such a Work; but, says he, it will not do for *Orange-Trees*, and it is but seldom that they shoot forth; they must be rais'd from the *Seed*, or grafted upon *Adam's Apples*. Notwithstanding

ing this, he adds, that *Myrrh-Trees*, *Laurels*, *Olives*, *Pomegranates*, and such like, may be rais'd by breaking off from those *Trees* in the Spring little *Branches* a Finger long, by cutting off the Tops, and planting them in long rows in Chests full of good Earth, and setting them in a shady place, for then they will take *Root*, if not all, at least the greatest part of 'em. In Winter they are carried into the *Green-house* or *Conservatory*, &c.

§ 3. From all this it appears, that other Lovers of *Gardening* have already taken notice, that the very *Branches*, tho' severed from the *Trunk*, are nevertheless so disposed as to take *Root* of themselves, and to propagate their Kind.

§ 4. I shall now bestow some further Thoughts on Father *Mandirola's* Method of *Multiplication*, which he try'd only with a *Branch* of *Citron* and *Lemon-Tree*, and in which he has been imitated by Mr. *Hochberg*. He says, as we have observed before, that in *April* he chose for his purpose fine streight and smooth *Branches*, both of *Citron* and *Lemon-Trees*, but not of *Orange-Trees*, their Wood being too hard and close. Tho' I doubt whether this be the true Reason why *Branches* of *Orange-Trees* don't take *Root*; for I have dress'd much harder Wood after my way with *Mummy* which yet has taken *Root*. Therefore I fancy if Father *Mandirola* had cover'd his *Branches* with *Mummy* at the bottom, so as that till *Roots* came to shoot, no offensive humour could have got in to occasion a Putrefaction, the *Branches* of *Orange-Trees* would have also taken *Root*, especially if cut off at the Joint or Knot. And I can assure the World with Truth, that such a thing has succeeded to me; and every Lover of *Gardening*, who will be at the trouble, will experience the same.

§ 5. Upon this, I farther examined why F. *Mandirola*, who is so well vers'd in this Art, strip'd the lower part of his *Branches* by scraping off the *Bark* the breadth of two or three Inches, when daily Experience may convince every body that the Wood thus bereaved of its *Bark* becomes the sooner a prey to Humidity and other

other Accidents; heats very soon, and begins to rot, especially when the *Pith* is affected, because the best nourishing Juices lye in the *Bark*.

My Opinion of it was, that since he only proposed to take off from the bottom of the *Branch* a certain length of *Bark*, he did it with design, that by such an *Incision*, and the taking off the Piece, a place for the *Root* might be adjusted. For that Father, being so well experienc'd, could not but know that no *Root* could grow out of the bare Wood strip'd of its *Bark*, since nothing could issue from it but a dewy Juice to settle round the place where the *Bark* was, and produce the *Root*. But supposing this was the Natural Method, and that the *Root* could really grow at that place, yet the two Inches of *Stem*, from whence the *Bark* was taken off, would be quite lost. 'Twould therefore be a fruitless Work; nay, it may be said that the Wood would rather prejudice than forward the *Branch*, because when it begins to rot, the *Bark* rots too, as we have already said; but let every body enjoy his own Opinion, I shall only endeavour to defend my own.

§ 6. On this occasion I shall begin with the *Leaves* of Exotick *Plants*; and having observed that the *Leaves* of some of them may very well be used instead of *Joints* or *Shoots*, I shall now undertake to shew how the *Leaves* take *Root*. The Curiosity for cultivating Vegetables, 'tis well known, has long since been carry'd so far, as to occasion an attempt to raise a *Tree* from a *Leaf*, just as F. *Mandirola* made the Experiment with a *Lemon-Tree-Leaf*. His Words upon this Subject taken out of his Writings are as follows. ' I try'd a Master-piece, to wit, to plant
' *Citron, Lemon*, and such like *Leaves* after the following manner.
' I took for that purpose a sort of little Flower-pot full of the best
' sifted Earth; I planted in it some *Leaves* of those kinds of *Trees*,
' with their *Stalks* so deep that the third part of the *Leaf* was co-
' ver'd with Earth; over that Pot I fastened a small Pitcher full

‘ of Water, so as that it might drop directly down into the middle
 ‘ of the Pot, and the hollow which was made by the falling of the
 ‘ Drops I continually filled up with fresh Earth; thus they cost
 ‘ me but a little Trouble, and they all shot up and grew very
 ‘ well, &c.

I pursu’d it with the greatest Patience in the World, and found that through a too often repeated dropping of the Water, the *Leaves* began to rot, and so wasted away of themselves by little and little, so as that at last nothing was left but the *Stems*, as Tab. 5. Part I. shewed it; but it having been observed since, that from the callous Matter that came forth at the bottom, both *Roots* and *Branches* shot out, it appears that all Exotick *Leaves* may at any time be converted into *Trees* in the following manner. For this Operation I make choice of the Months of *July*, *August*, and *November*; but those who have *Stoves* and *Green-houses* may perform it even in Winter, and in that case they shoot the better in the Spring. Those who have a mind to do it in the Spring, will have some Success, but it is not so very sure, which ought to be chiefly ascribed to the Inconstancy of that Season.

§ 7. I shall now acquaint the Publick with my Method, and how by the means of the *Mummy* a *Shoot* may be produced from the side of any Exotick *Leaf*, which, while the *Leaf* ceases to grow, will come by degrees to be a large *Tree*. I go to work thus: I take an *Orange*, *Lemon*, or *Laurel-Leaf*, or one of another *Tree*, without any *Bud*, as the following *Table* shews it at (a.) I cut it even underneath to the little *Heart-Leaf* (b.) then I dip it a third part into the noble *Mummy* made warm as at (C. D.) and set it in well-prepared Earth; I mean as much of it as is done up with *Mummy*. When it has stood there a while, the *Mummy* breaks of itself by degrees, and a callous Matter comes out, from which small *Roots* together with a little *Trunk* shoot, as at (E. F.) This grows more and more in height, till,
 as

as the Figure represents it, Tab. 5. Sect. 2. it attains to the perfection of a *Tree*: This Operation not only succeeds as to *Orange*, *Lemon*, and *Laurel-Leaves*, (as appears by G. H. which is a *Bud* of a *Laurel-Leaf* that took *Root* at the bottom, by the means of the *Mummy* it was done up with, and shot out the beginning of a *Trunk*) but also as to others, as appears by a prepared *Leaf* of *Jucca gloriosa*, Fig. 1. which also took *Root* at the bottom, but has not as yet gone further: Time will let us see what Nature can do more. I also undertook something with little *Rosemary-Leaves*, and for a fancy did 'em up with *Mummy*, and planted them, by which means little *Roots* appeared, as at (K. L.) I did the same with great and small *Myrtle-Leaves*, and with small *Palm-Leaves*, and met with some Success. In fine, Curiosity led me so far as to try the same with *Carnation-Leaves*; when I had done them up in the same manner, I discovered also some *Roots*, as (M. N.) represent it; whether perfect *Carnation Plants* will come out of them, is what I long to see.

§ 8. Since I cannot yet deny myself the Satisfaction which my treating of the *Multiplication* of Exotick *Leaves* affords me, I shall proceed to impart my Thoughts concerning the method of cutting off such *Leaves* as are furnish'd with a *Bud*. Take, for Example, a *Branch* of an *Orange-Tree* that has several *Buds* with one or two little *Leaves*; take off one *Leaf* before and one behind, and leave the middle one, as (a.) shews you, then cut it so in regard to the *Buds*, as to leave always two upon the *Branch*, but they must be without *Leaves*. Lastly, Do it up with the noble *Mummy*, and then *Roots* will proceed from the *Buds* without *Leaves*, as (P. P.) make it appear. The same Method may be us'd with other Exotick *Stems*, as at (Q.) To conclude, I had a mind to add to it a *Sprig* of *Carnation*, which being done with *Mummy* and set in Earth, shot *Roots* here and there at the *Joint*. But of this more will be said in its proper place.

§ 9. Since I can blame no body for using his Endeavours to bring his *Plants* as soon as possible to their full Growth; I shall here communicate to the World my way of cutting off *Joints*, by which means great *Branches* of *Orange-trees* may become perfect *Trees*, and be caus'd quickly to Blossom and bring forth Fruit, as Tab. 13. will more particularly shew. In order to this I take a long *Branch*, either of an *Orange*, *Citron*, or *Lemon-Tree*, as at (*a. b.*) (the longer it is, the higher the *Tree* grows) and I cut it according to its *Joints* or *Years*; when the first Joint, which is very near the *Trunk*, can be met with, a great deal is got by it, as to the length of the *Branch*, but if it can't you must look for the next; then all the *Side-branches* of two or three *Years* and upwards must be cut quite off, but carefully kept; for if you treat 'em according to their Age, you will have as many little *Orange-trees*. As to the smallest *Twigs*, which are again to be taken off with the Knife, they may be cut below the *Buds*, either with, or without *Leaves*, as aforesaid, and done up with the noble *Mummy*; in this manner nothing is lost, and all may come to be either *Trees* or *Shrubs*, which certainly is an Art both very singular and diverting, and such as no body as yet has practised.

§ 10. When a long *Branch*, such as (*a. b.*) has *Buds* with one single *Leaf*, these may be suffer'd to remain, according to (*C. D.*) but when a *Branch* is freed from the *Twigs* of the age of some *Years*, then it must be bent in a Semicircle, according to the Figures 1 and 2, in this Tab. Afterwards you may take a small bit of a *Branch* that has been cut to pieces, and apply it to the Sinuosity or Bending B, as (*E.*) explains it: This is to be tied on with Packthread, and on the other side (*F.*) another little Stick is also to be laid and ty'd with the same Packthread; then the Packthread is to be brought over (*G.*) and (*H. I.*) are to be applied underneath; all which is done that neither *Bark* nor
Trunk

Trunk may be cut by the Packthread. Lastly, the whole is to be dipt in the *noble Mummy* a little cooled, and thus committed to the Ground.

§ 11. When a *Branch* thus prepar'd has been in the Ground for some while, it begins to shoot its *Roots* both through the *Joints* and the *Pores* of the *Bark*, upon the falling off of the *Mummy*, as (*K.*) shews in Fig. 2. And this is the true Method of cutting the *Joints*, and bending of exotick *Trees*, or rather *Branches*, which will yield incredible Satisfaction to the Curious, who shall carefully observe these Directions. Here it may be query'd, How Long *Branches* that have never a *Joint* must be treated? To this I answer, That they will shoot out better, if cut with *Buds*, and planted after having been done up with *Mummy*: Yet even thus they are not brought to any Perfection without much difficulty, being often kept backward through their Tenderness; but such as have a *Joint* seldom fail to flourish, for the Reasons above-mentioned. 'Tis also observable, that such *Branches* as have been bent upon their *Joints*, grow better than those which have been cut off at the *Joint*, and planted streight in the Ground. But this Reason, among several others, may be assign'd for it, *viz.* that in the former manner the *Nerves* are better clos'd near the *Joint*, and consequently are wider, by which means the nourishing *Juice* below it is the better fix'd at the bottom of the *Joint*; and being there in great plenty, the Matter of the *Roots* comes out the sooner, and makes them grow to a greater Perfection. As one exotick *Branch* is managed, so may all others be.

§ 12. Before I conclude this Chapter, I must say something of my way of planting a *Branch* of an *Orange-tree* the wrong End upwards. In *August* I took a *Branch* of an *Orange-tree*, pretty big, (as appears by Tab. 23. Fig. 3. *L. M.*) I had taken off from it, as I use to do, all the *Side-branches*, but not the *Buds*; and I had cut it exactly at the *Joint*, after I had well dress'd it
above

above and below with *Mummy*, and secur'd it at the bottom with Props and Ligatures, as is seen at (*N. O.*) I planted it the reverse way, so that the small End was downwards, and the big End upwards, whence it necessarily followed that the *Buds* with their *Leaves* hung downwards. When the *Root* began to appear at the bottom upon the breaking of the *Mummy*, the *Buds* also began to shoot, and became very fine *Twigs*, as you see (*P. P. P.*) I am very positive that the Curious will be led into a great many agreeable Discoveries by the means of such an Invention. But whoever is much employ'd in the reverse way of *Multiplication* and *Plantation*, must have a good Stove or Repository, especially for exotick *Trees*; therefore I shall here give a Description of my Stove, which I caused to be built in a great Hurry last Winter in the middle of *December*, in order to proceed further and without any Intermission in my Discoveries.

§ 13. I would have no Body think I give it here as a Pattern for all others; 'tis only for the sake of those who have but little room in their *Gardens*, that they may have such a Conveniency with less Charges; those who will imitate it, or make any Alteration or Amendment in it, are very welcome to use it at their Pleasure. My Stove or Repository is sixteen Foot long, and twelve wide, as may be seen in (*A. B.*) and (*A. C.*) the Walls are eight Foot in height behind, and twelve before, as in (*C. D.*) and *A. D.* being compos'd of Pieces of Wood laid a cross, plaister'd on both sides with Clay and chop'd Straw mix'd together, and cover'd with Boards both without and within. The Top consists of a double Roof after the same manner, that so the Warmth may be the better preserved. On the Outside over the Sashes are wooden Shutters with Hooks, that they may be put on and taken off at Pleasure; and that the Glass might not be subject to be broke, I caus'd it to be cover'd with Iron-wire for the Shutters to rest upon. As to the Panes, I caus'd 'em for certain Reasons to be made round, and not of common Glafs; but the time being too short
to

to answer the Query, Whether round or oblong Panes are the best, I leave it till another Opportunity. Underneath the great Windows there is a little one that may be open'd when thought fit to let in fresh Air if Occasion be.

§ 14. As to the Inside of the Stove or Repository, immediately next to the Windows, there is a hot Bed well prepared. I have here a good Opportunity to speak of it at large; and to let my Antagonist see he is not the only Man that can contrive good hot Beds, but that others besides him know very well how to order them. But this I reserve for that Part wherein I shall treat of the sudden Growth of all *Plants*. Near it is a Stage rais'd with Steps, on which the *Flower* or *Garden Pots* are plac'd, and in which the little *Branches* or *Leaves* done up with *Mummy* are planted. Besides this, there is a Fire-hearth with winding Pipes, which cross the Room, and keep it in the same degree of Warmth. I had propos'd to add one of a quite different Invention, which would have taken up less room; and being heated with less Fire, would yet have communicated to the Room the same moderate degree of Warmth; but, to my great Sorrow, all my Business being to be dispatch'd in a Hurry, the best Thoughts often remain unfinish'd; however, I shall impart them in time. The Fire-hearth I just now spoke of lies within, but the Fire is kindled from without. On the Top-plate is a Coppel, or Cupola, to give the more room to the Smoke; but the Engraver forgot it. Above this is a Latten Pipe turn'd elbow-wise, and furnish'd within with a sort of Valve or Cock, to keep the Heat in. To this are join'd wide Pipes of Potters Clay, which grow narrower by degrees, and are well clos'd on the Sides, that the Smoak may not go out; these go winding about the Repository, and end like the Top of a Chimney, over which a piece of Iron is fastned, with a Pipe across, and two Holes, that the Wind may not keep the Smoak from going up; but the whole will appear more clearly in the Figure annex'd.

T A B L E XXII.

Represents all sorts of exotick Leaves, both with and without Buds, which have taken Root, being done up with Mummy.

(A.) *Shews an Orange-tree Leaf without ever a Bud, which still retains at the bottom its little Heart-leaf (B.)*

(C. D.) *The same Leaf, the third part of which was done over with Mummy.*

(E.) *How that same Leaf got in time at its bottom a sort of Callosity, and shot some little Roots; out of which, at the same time, came the beginning of a young Trunk or Twig, as in (F.)*

(G. H.) *A Laurel-tree Leaf done over with Mummy, which, having broke the Mummy, was taking Root, and began to shoot some Twigs.*

(I.) *A little Leaf of Jucca gloriosa likewise done over with Mummy, which has taken Root by that means; but as yet never a Sign appears that it will shoot a Branch. I shan't fail to acquaint the Publick in time with what shall happen.*

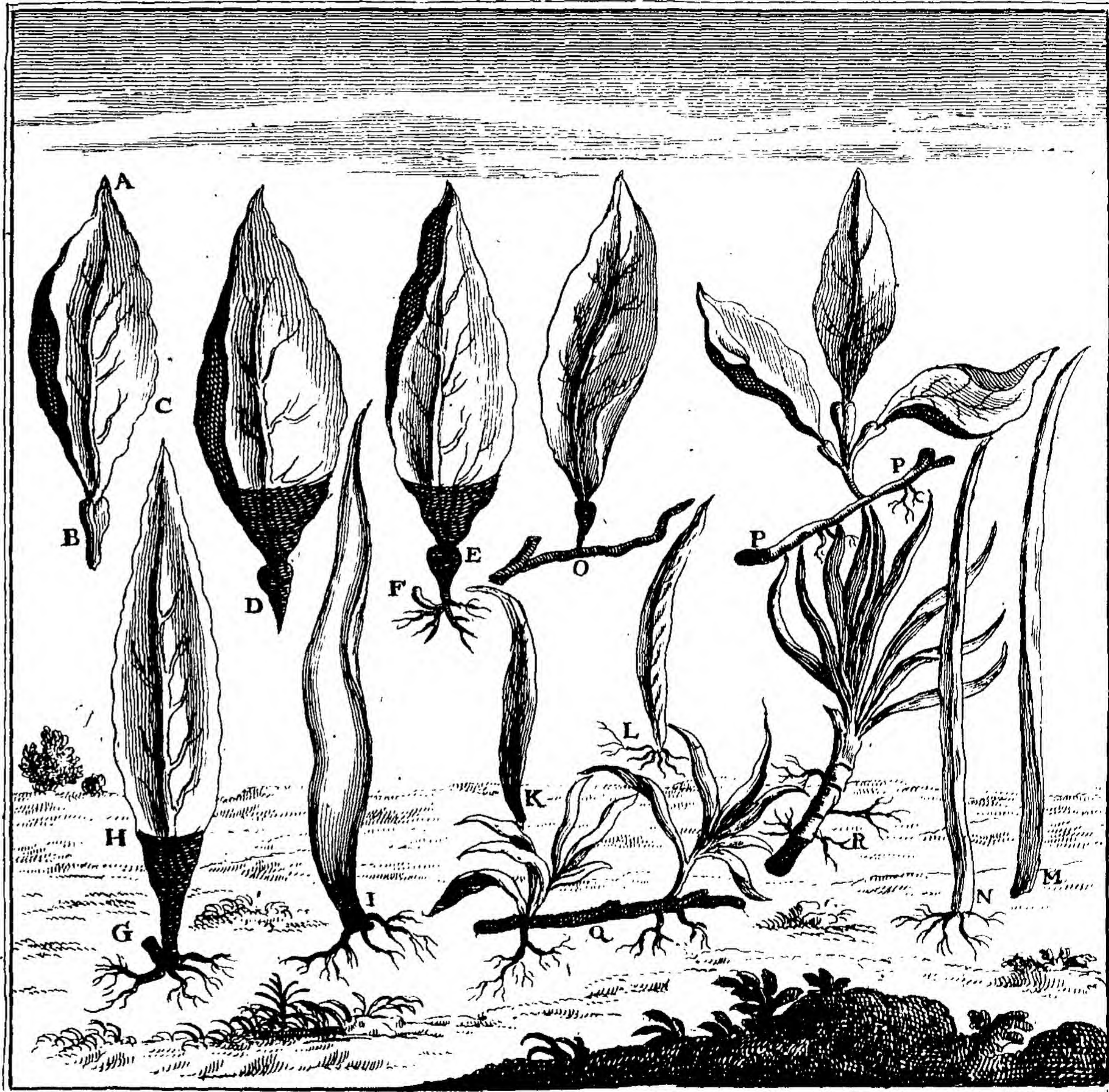
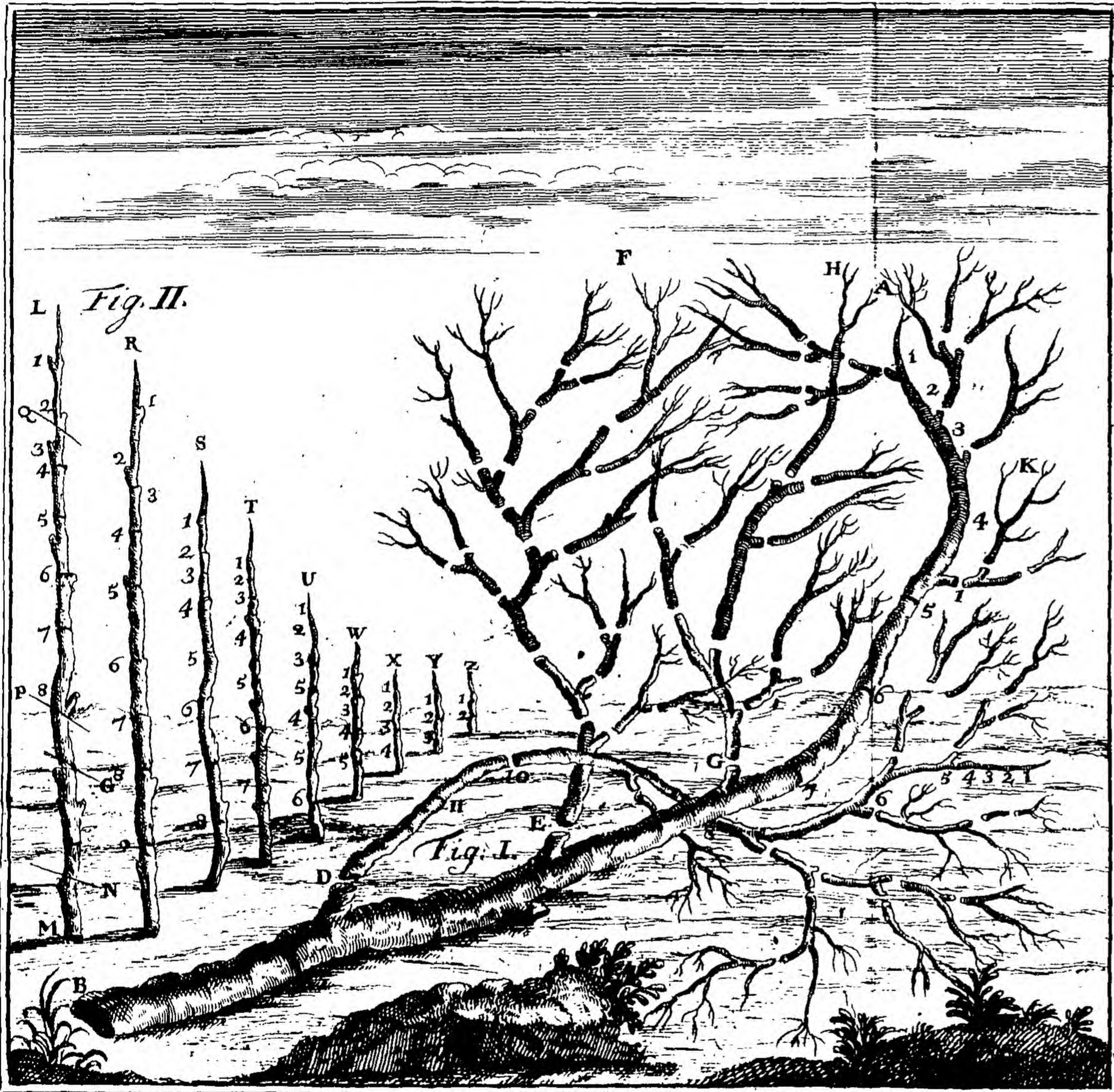
(K. L.) *Some little Rosemary-leaves done over with Mummy, which began to have little Roots at the bottom; I tried the same for a Fancy with Myrrh-leaves, and such like.*

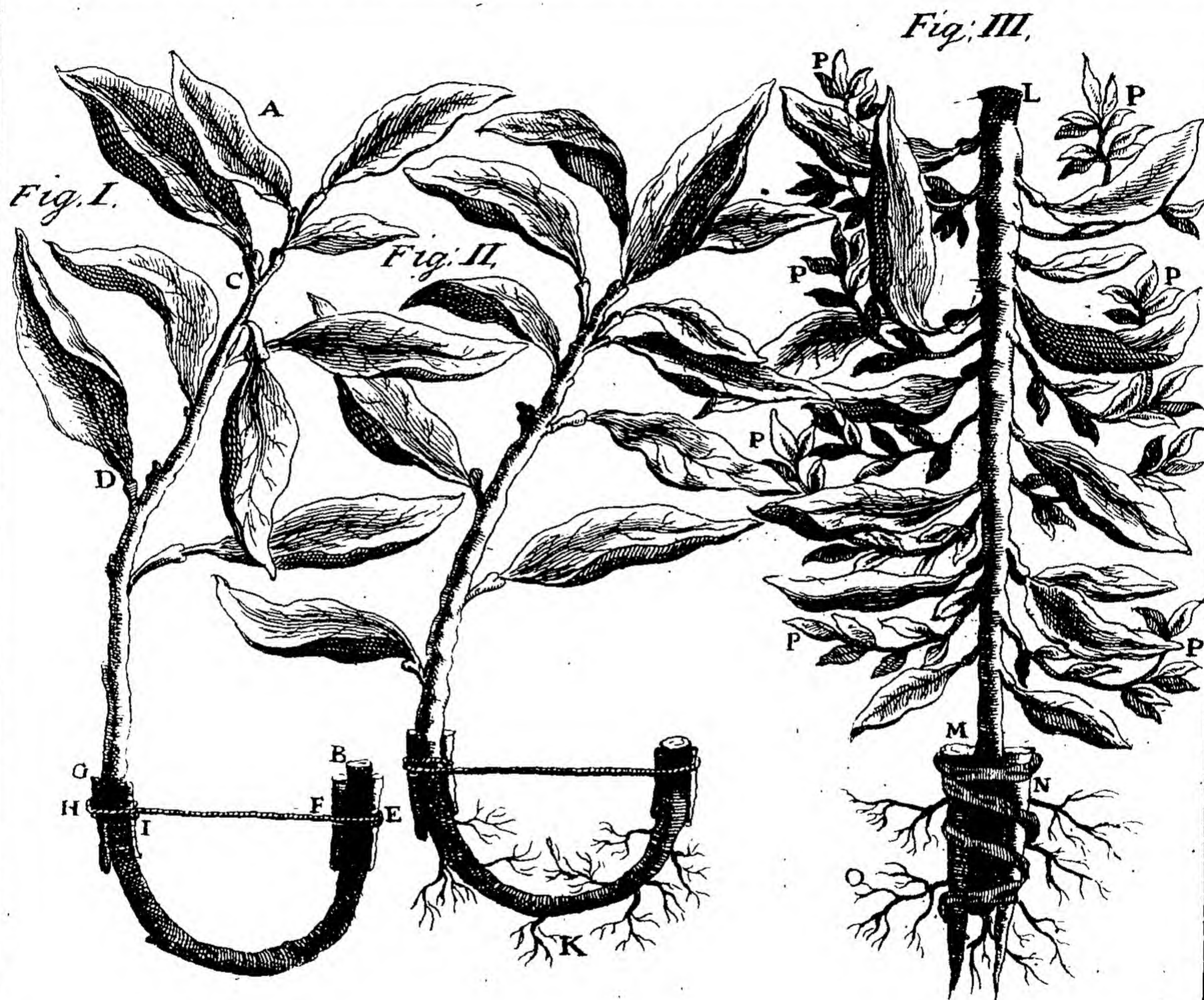
(M. N.) *Is an Hint of the Desire I have to raise Carnations from Carnation-leaves; having prepar'd them well after my way, I also discovered that they had got little Roots, Time will shew what may be further expected from them.*

(O.) *A Leaf with a Bud still upon its Branch, which has two Buds more, but without Leaves; being done up with Mummy, 'twas planted in the Ground in a proper manner.*

(P. P.) *How Buds and Branches of an Orange-tree severed from the Trunk, have shot out Roots.*

(Q.) *Such*





(Q.) *Such another Contrivance in Gardening tried with a Twig of Rosemary, which has shot out Roots from all its Joints.*

(R.) *A whole Carnation-Plant, which was taken up about Midsummer, made even and smooth at the bottom, done over with the noble Mummy, and planted again; which, after it had been a while in the Ground, shot out little Roots on every side near the Knots or Joints, and multiplied it self that way. Those who have a Fancy for raising Carnations in this manner, will quickly have a great quantity of them.*

T A B L E XXIII.

Shews several Branches of Citron and Lemon-trees, thick and long, and very old, which yet are come to the Perfection of Trees, by cutting them at the Joint; also a Branch of the natural Plantation the wrong End upwards.

Fig. I. *A Branch of an Orange-tree, which has a great many Joints, from which all the Side-branches have been cut off, as at (A. B.)*

(C. D.) *Shew that the Buds that have one Leaf may very well be left on the Branch; but when they are on little Branches of one or two Joints or Years, it will not do so well, the Branch not having as yet Strength and Juice enough to nourish 'em; therefore they must be cut off.*

(E. F.) *How the Branch or Twig is to be secur'd with little Sticks, that it may not be damaged by the Packthread.*

(G.) *A bit of Packthread to bend the Branch withal, that it may be kept firm, till it be done over with Mummy, and set in the Ground.*

(H. I.) *How the little Sticks are fastened underneath the other side.*

Fig. II. *Another Branch of an Orange-tree plaister'd with Mummy, and freed from all its Side-branches, but the Incisions well*
L I *dress'd*

dress'd as before; when it had lain six Months under Ground, being taken up, upon a diligent Search it was discovered, that at the bottom under the Mummy, partly from the Joints, and partly from the little Points which are observ'd on Branches, the Roots shot forth plentifully, as is clearly represented by (K.)

Fig. III. Is a large Branch of an Orange-tree (L. M.) which represents a natural Planting revers'd; for 'tis known that several curious Persons by grafting Buds and Branches the reverse way, have produc'd all sorts of fine Trees, in which Method I had also taken a great deal of Pleasure. I therefore had a mind to try if I could not in a natural manner, and without giving my self so much Trouble as formerly, cultivate Branches the reverse way, which I did with good Effect, and they yielded a very agreeable Prospect, as may be perceiv'd by the Figure.

This Branch having been cut above and below at the Joints, and stript of all its Boughs, was dipp'd in the noble Mummy, and fasten'd to little Pegs, as per (N.) After it had, according to (O.) shot its Roots, the Buds sprouted out on all sides, from which the Branches grew, turning upward, or in a semi-circular manner, according to (P. P. P.) which was extremely delightful. This may be practis'd on great Branches as well as small, to the great Content of those who make the Tryal.

T A B L E XXIV.

Which represents my Stove or Repository, which I built last December in haste, in order to facilitate my Experiments.

Fig. 1. The Length of the Stove; which yet is no Rule for any other, I being oblig'd to order it according to the Scantiness of my Room.

(A. B.) Represent the Length, and (C. D.) the Height next the Wall.

(E. E.) The

(E.E.) *The wooden Shutters to cover the Windows.*

(F.F.) *The Glass-windows, which for certain Reasons were made with round Panes.*

(G.) *A little Window opening to let in the Air when it is thought fit.*

(H.) *The Stages on which the Pots are set, wherein the exotick Leaves, Shoots and Branches are planted.*

(I.) *The Fire-place, which is within the Stove in the Ground; and how the Pipe conveys the Heat round the Stove, till at last it rises up like a Chimney, (L.L.L.)*

(K.) *The outward part of the Fire-place and Pit, into which one goes down by Stairs to light the Fire.*

Fig. II. *The Fire-place better represented with its winding Pipe; and how it traverses the whole Stove.*

(M.) *The Fire-place, the Inside of which is built as common Stoves are; but the Outside is of Stone having a little Grate at bottom, and a Door in the side of Latten, with a Traverse according to (N.)*

(N.) *A Latten Pipe, which must fit to a high Coppel, (which is not represented in the Figure) that the Smoke may have a free Passage upwards, for otherwise it would descend, and could not rise thro' the Pipe.*

(O.) *Earthen Pipes; as to which it must be observ'd, that the first should be always bigger than the following; an able Potter will know how to manage that.*

(P.) *Shews how the Latten Pipe (R.) is to be plac'd upon the Extremity of the Earthen Pipes, that the Wind may not hinder the Smoke from rising.*

(Q.) *The crooked Funnel of Latten with its Cock made to fix on the Coppel of the Stove.*

P L A T E II.

Which represents the Inside of the Stove, as also the Outside of the Fire-hearth and the Dung-pit, which is shewn both Outside and Inside.

Fig. I. (A.) *The Outside of the Fire-hearth, as it is fitted up. There is a Chimney of Wood lined within with Clay, through which the Smoke rises.*

(B.) *The Latten Pipe at the end of the Clay Pipes, which winding conveys the Smoke out.*

(C.) *A Pent-house over the Pit, against Rain.*

(D.) *A little Window, which may be open'd at pleasure when there is any Smoke in the Stove, or one has a mind to let in the fresh Air.*

(E.) *Wood for burning.*

(F.) *The Windows of the Stove open'd to shew the Inside.*

(G.) *Another larger Window, which is open'd sometimes, when one does not think fit to open the Windows at top.*

(H.) *The Door of the Stove.*

(I.) *The Stage with the Plants.*

(K.) *The hot Bed, in which are planted all manner of Cions dressed with Mummy*

Fig. II. *My Invention for placing the hot Bed in the Stove, so as that it may be supply'd with fresh Dung without much trouble, and the Dung which has lost its Virtue may with ease be taken away.*

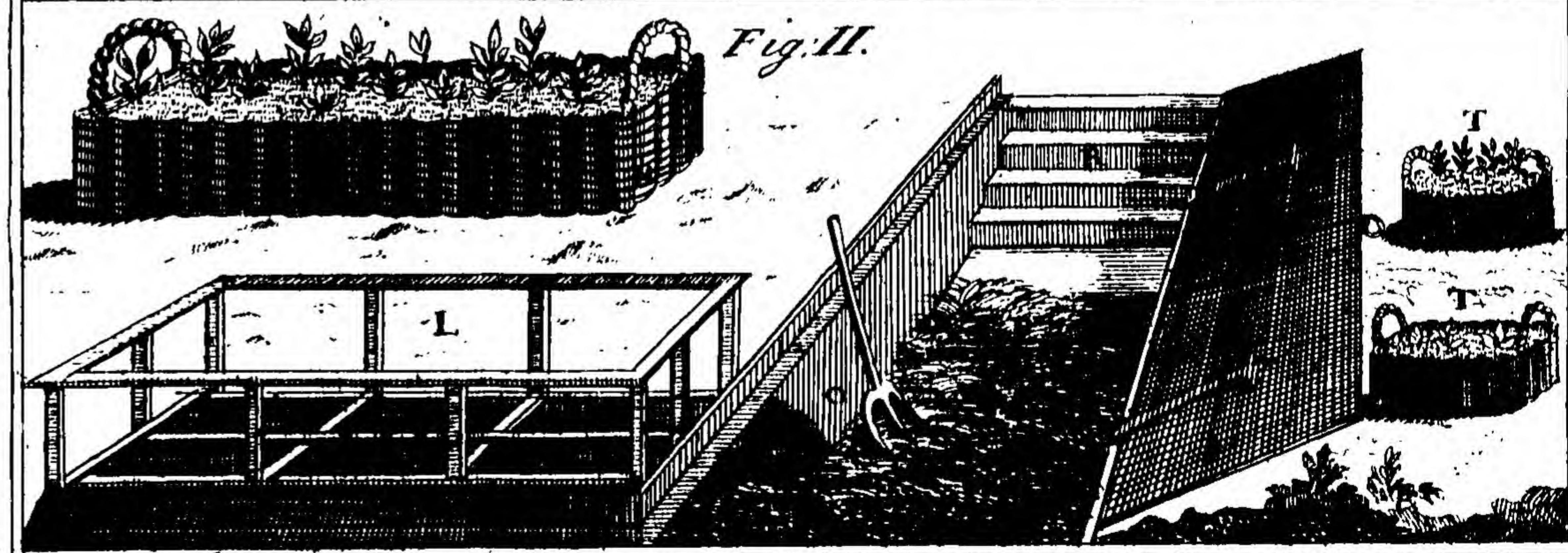
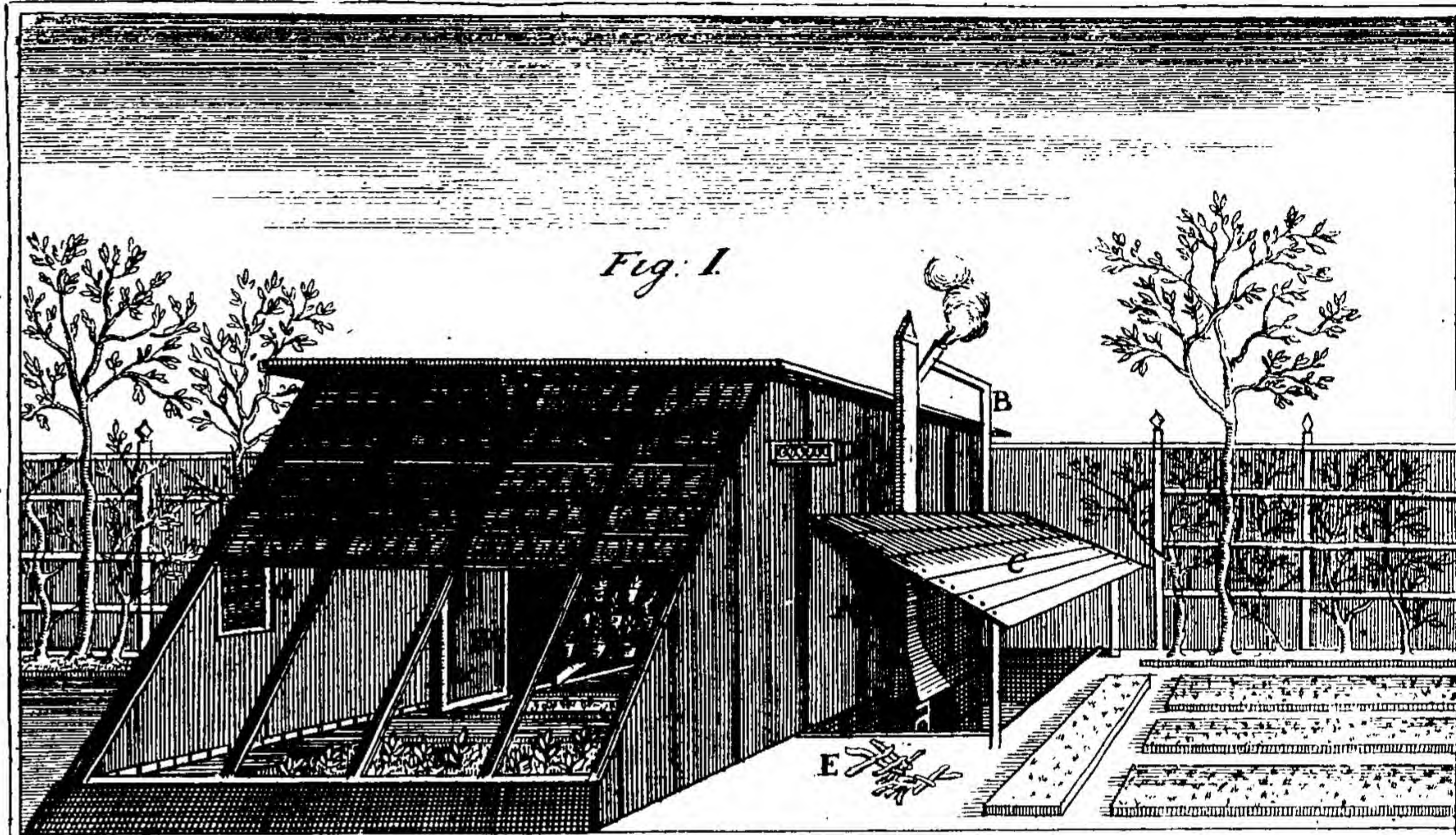
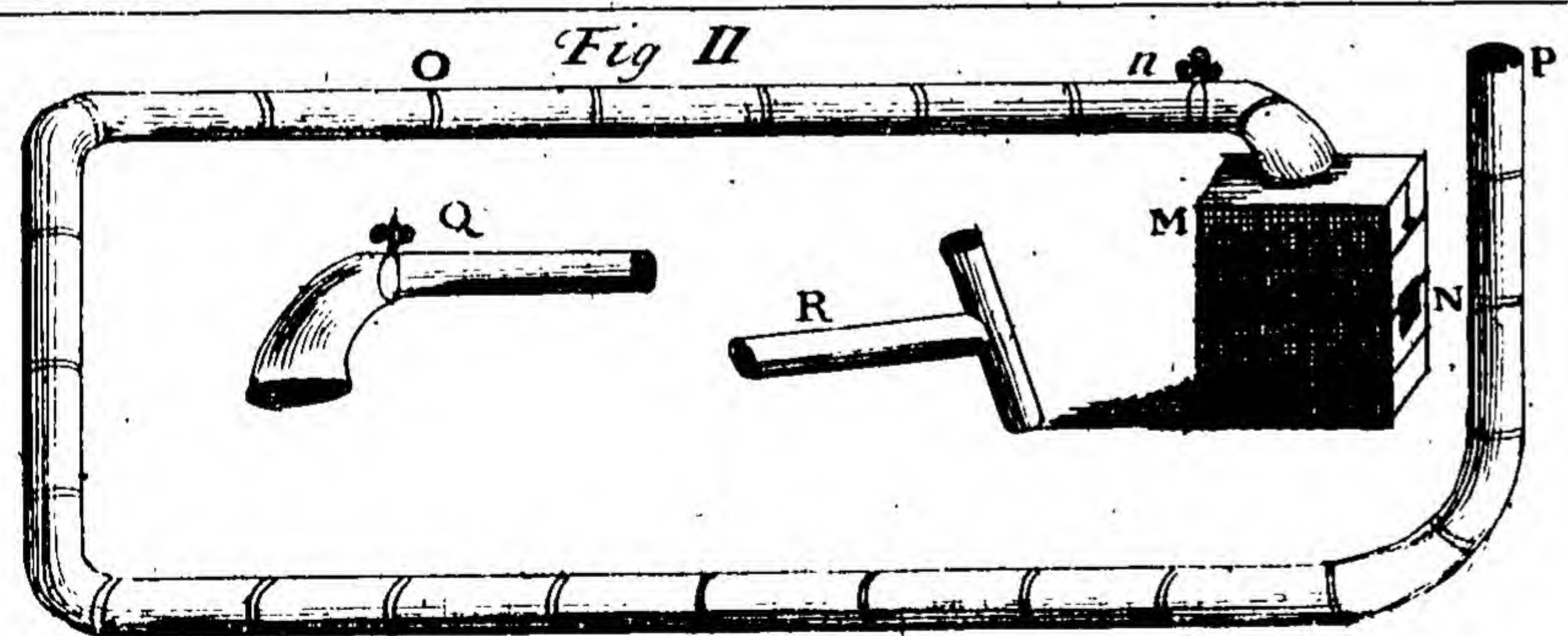
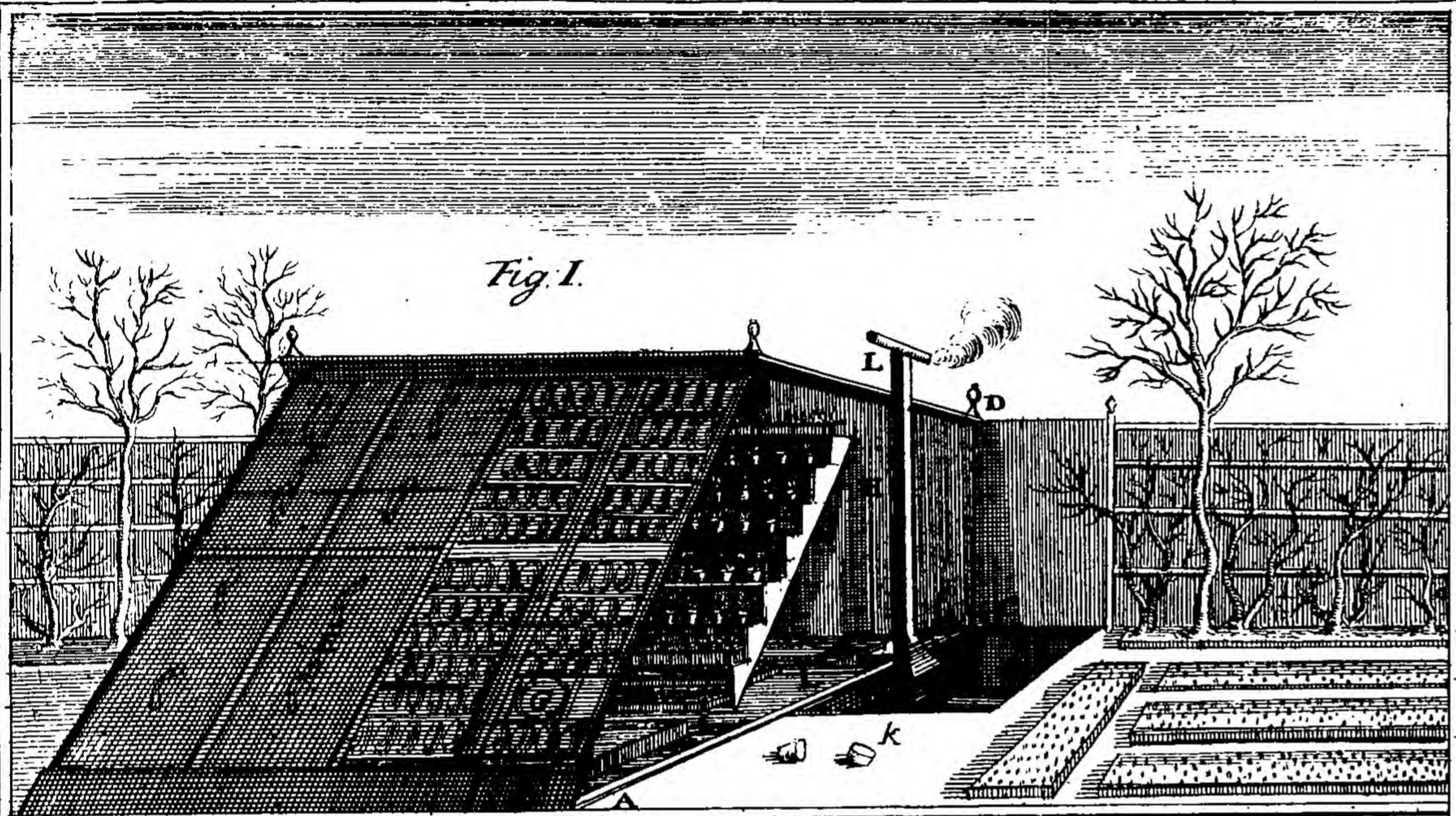
(L.) *A wooden Frame on which a square Basket is set.*

(M.) *The Basket filled with good sifted Earth, in which the Branches are planted, which are dress'd with Mummy.*

(N.) *The Pit where the Dung is kept.*

(O.) *The Passage for conveying the Dung out and in.*

(P.) *The*



(P.) *The Dung which is put under the Basket, and is renew'd as often as the Sal Volatile Urinæ evaporates.*

(R.) *The Steps to the Dung-pit.*

(S.) *The wooden Shutter to the Dung-pit, which serves as well to hide the Nastiness, as to hinder the Dissipation of the volatile Parts of the Dung.*

(T. T.) *Little Baskets, which we shall speak of by and by.*

CHAP. IV.

Which shews how by the last Proposition to multiply common FRUIT-TREES to an almost infinite Degree; and to plant 'em in GARDENS, FIELDS and WOODS.

§ 1. **A**S there are few People who have not a just Value for a Tree which bears its *Fruit* abundantly; so there have been curious Persons in all Ages, who have endeavour'd at the *Multiplication* and *Culture* of such Trees, which *Culture* Nature shews us to be no way more profitably, more readily, or more easily practis'd, than by the *Seed*, as we have observ'd more at large in Sect. 2. Part I. and that this Manner has been always in use, Mr. *Hochberg* testifies in the Second Part of his *Noble Country Life*, Chap. 6.

‘ We have certainly just Reason to admire the Wisdom, and
 ‘ Omnipotence of God in that, among other things, he has or-
 ‘ dain'd that a pretty large Bean shall produce only a small *Stalk*
 ‘ of an Ell, or an Ell and half high, which a Child of two Years
 old

‘ old may carry: Whereas from the little *Kernel* of an *Apple* or
 ‘ *Pear* a *Tree* shall grow, which can hardly be laden upon fifteen
 ‘ or twenty Carts, and whose *Stock* is often so big, that three
 ‘ or four Men can scarce embrace it; so high, that it sometimes
 ‘ shoots up more than twenty Fathom; so wide, that twenty Men
 ‘ or more may rest under its Shadow; and so fruitful, that two
 ‘ or three Carts may be laden with its *Fruit*. Again, it is sur-
 ‘ prising to think, that if one employ’d only the *Kernels* of one
 ‘ single *Apple* or *Pear-tree*, a *Wood* might easily be rais’d, which
 ‘ would cover a Square of a thousand Paces.

§ 2. But tho’ there are still some who raise *Fruit-trees* from the
Kernels, yet they use ’em only to graff or inoculate upon; be-
 ing perswaded that *Trees* rais’d from the *Kernels*, tho’ of never
 so good a sort, would be of a wildish Nature, and produce but
 indifferent *Fruit*. But Mr. *Rantzau*, Governor of *Holstein*, is
 of a quite different Opinion, according to the mention’d Author,
 when he says, ‘ I am of Opinion, that it is not necessary to graff
 ‘ *Trees* which are rais’d from the *Kernels*, and are of a good sort;
 ‘ it is sufficient to transplant ’em the oftner, viz. three or four
 ‘ times; for then their *Fruit* will be as good and as well tasted as
 ‘ the *Fruit* it self which you took the *Kernels* from.

Mr. *John Royer* confirms the same thing, adding, that he had
 rais’d *Trees* from the *Kernels* which flower’d, and bore such fine
Fruit, that he himself was amaz’d at it; their *Fruit* being of a
 rare sort, different from all he had ever had. I shall soon see a
 Proof of this, having planted about three Years ago a hundred
Kernels of the best *Fruits*, which for the most part sprouted;
 the first Year I transplanted ’em; the second I cut off all the little
Branches, with the main *Branch* it self, all to one *Bud*, and
 dress’d the Incisions with *Mummy*; the third Year I transplanted
 them again in the Season; and now I intend to prune ’em again
 all to two or three *Buds*. I find already that the *Stocks* grow
 the

the streighter, and produce fewer Excrescences. Whether this manner will help Nature, is what Time will shew.

§ 3. But as it is Natural (especially to those who meddle with *Gardening*) to desire a quick growth, we must not wonder if we see People impatient to bring what they have sown or planted to Perfection, thinking it much to stay till Nature has finish'd her Course; whereas they ought to consider the time which past e're they themselves came to a full growth, which will make them sensible that Nature is not to be forc'd, but suffer'd to take her Course, according to the Proverb, *Natura non facit Saltum*, Nature makes no Leap. Besides, we are but Men; not the Masters, but the Servants of Nature. Yet since God has left us at liberty to order *Plants* as we please, we have invented a great many ways as well for the *Multiplication*, as for the *Improvement* of *Plants*; and these Methods encrease every Day. For my part, I propose to apply my manner of *Universal Propagation*, as well to our native *Trees*, as to Exoticks, viz. that of cutting the *Joints*, bowing the *Branches*, dressing with *Mummy*, and planting them. 'Tis foolish to discredit this and the other Propositions I have made, by reporting 'em to be mere *Chimeras*, and running 'em down to the last degree. Let such People look into any Authors who have written upon the Subject, and they will find that all have partly practis'd the same Methods. The above-mention'd Author is so esteem'd that he is in almost every body's Hands. He says, in his 18th Chap. 'Some *Trees* are of
' such a nature, that when one cuts the ends of their streight and
' fresh *Branches* which shot well, and plants 'em in the Earth in
' a fresh, moist, and clayish Ground, mix'd with Cow-dung, and
' sown with *Barley* and *Oats*, the holes being well fill'd up, and
' the Earth press'd close down, and cover'd with a fresh moist
' clayish *Turf* turn'd up, then these *Branches* take *Root* and shoot
' up. In this manner one may raise *Fig-trees*, *Rose-trees*, *Apple*, *Pear*, *Medlar*, *Cherry*, and *Mulberry-trees*, and especially
' such

such as have large Kernels'. I shall not here examine whether the *Barley* and *Oats* contribute much to the shooting of the *Roots*, nor whether one need only plant the *Sets* in Cow-dung without any dressing; it is enough that every one may see by this, that they do take *Root*; and if this planting had the desired Success, when there was no care taken of cutting the *Joints* and waxing 'em, in which nevertheless the chief Art consists, much rather may we expect a happy issue when we do all that Nature requires of us.

§ 4. I shall repeat this manner of working in few Words. When you would plant *Trees* in *Gardens*, *Fields*, or on *Mountains*, you must have ready a great number of long, thick, and streight *Branches*, as for Example, of good *Apple*, *Pear*, *Chestnut*, *Walnut*, *Apricot*, *Peach*, *Mulberry*, *Cherry*, and *Morrella-Trees*. And he that has a large *Orchard* may furnish himself with all, without being beholden to any body, and may make use of the superfluous *Branches* which are prun'd off in Spring, inasmuch as a great quantity of *Branches* will be requir'd to plant a large *Orchard*.

By what I have observ'd in the time I have employ'd myself in it, the best Season for this Operation is Autumn. About *All-Saints-Day* last, I cut several thousands of *Stocks* in their *Joints*, which I dress'd with *Mummy*; of these I planted a great many in the open Air, especially the long *Branches*, which were bent round, and tied with Straw; but I carried such as were smaller into my mention'd Repository, which is describ'd in Plate 25. here annex'd. I made two Places for them, one in the open Air, and another cover'd, the latter dry, and the former moist, for which reason I put the large *Branches* there, and I shall soon see which of the two will thrive best.

§ 5. The reason why I did not immediately plant the small *Shoots* in open Air, was only to preserve 'em from Cold and the Injuries

injuries of the Weather. Nor do I expose them to the Air till the middle or latter end of *April*. In the mean time, for six Months together, they have a proper occasion of taking *Root*; after which, when the *Balsamick* Season approaches, and they are brought into the Air, they begin to shoot both at top and bottom, and that is the reason why I rather chuse the Autumn and Winter for this purpose than the Spring. For tho' such who cut their *Branches* in *March* or *April*, and plant them as they should do, will see 'em sprout sufficiently well; yet on the other hand they are more expos'd to Accidents, on account of the more plentiful rising of the *Sap*, and the great Heats which we have oftner in *March* and *April* than in Autumn, and which often cause 'em to wither; but we must try all ways, and we often hazard other *Trees* which have *Roots*, without being surpris'd when they die.

How to cut the Joints, and accommodate them with Mummy.

§ 1. The way is thus; Chuse the best and streightest *Boughs*, cut them at bottom near the *Joint*, then Prune off all the collateral *Branches*; but if you find any young *Shoots* of a Year or two old, you may leave them on the *Stock* or *Branch*, which has Strength and *Sap* enough to nourish the *Buds*. The long *Branches* which have a great many *Joints*, may be cut off at the first or second *Joint*, (according as things are dispos'd) and the *Incisions* dress'd with *Mummy*; for by reason of their tenderness they easily die in the Winter, and infect the other *Joints*, and sometimes the *Branches* themselves.

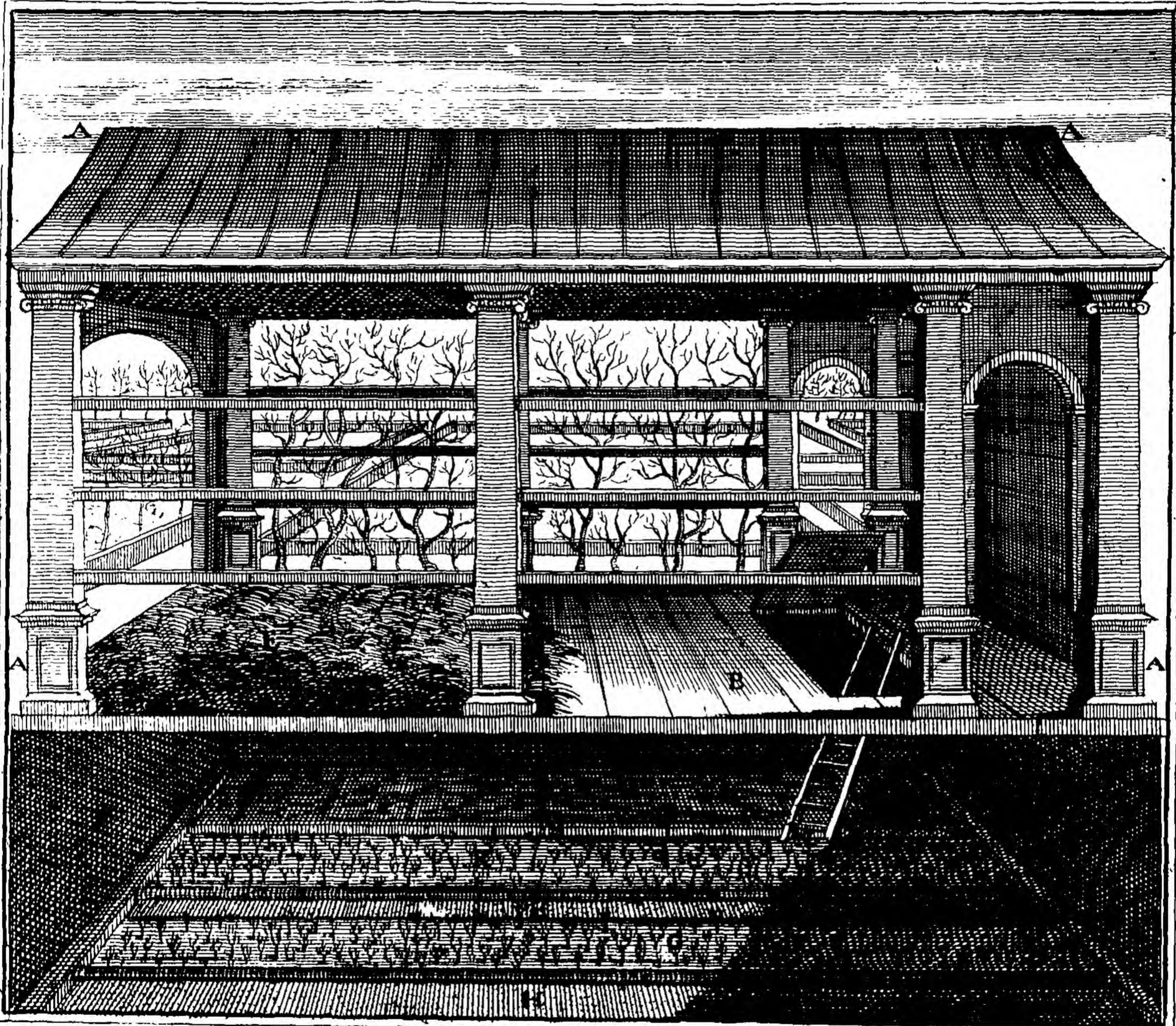
§ 2. After you have cut a large *Branch* with a great many *Joints* or *Years*, according to Art, try if it will bend well at bottom, if you bend it quite round 'tis so much the better, for all *Branches*, whether Exotick or others, sprout the better by this Means. But the 26th Plate will shew how to bend them, and

fix little bits of Wood to 'em, as also how to secure the bending with Bals, Packthread, twisted Straw, Osiers, or the like. We have spoken sufficiently of it in treating of the bending of Exotick *Trees*; I shall only say here, that a large *Branch* is bent the same way as a little one, but in case the *Branch* is so thick as to be inflexible, you must content yourself with cutting it in the *Joint*, and dressing the *Incision* with *Mummy*; after which you must fix it to little Pickets, that it may stand the firmer in the Ground.

§ 3. When the *Branches* are cut off at the *Joints*, smooth'd at bottom, and bent as they should be, dress them with *Mummy*, and plaister 'em over with common melted *Pitch* or *Rosin*, that no wet may hurt 'em, or hinder their growth before the *Roots* and *Sprigs* begin to shoot. I know very well, that a great many People laugh at it, but that is through Ignorance; and I am persuaded they'll have a more advantageous Notion of it, when they consider the Effects of the *Rosin* and *Pitch*, to which I have presum'd to give the honourable name of *Vegetable Mummy*; to prepare which, you must take a large Kettle or Earthen Pot, and fill it about a third part with common black *Pitch*, and if you don't value the Charge, you may add to it a little fine *Rosin* or sulphurated *Pitch*, and a little yellow *Wax*; melt all this together, and when it is liquid take it from the Fire, and let it stand till it has done smoaking. Being cool, you may with a Brush made for that purpose, plaister the *Incisions* as is directed by the Plate annex'd.

§ 4. I shall now shew in few Words, how, and in what Season the *Branches* and *Stocks* are to be planted. As for the Season, I have already said that Autumn or the beginning of Winter is the most proper time, tho' we ought not altogether to exclude the Spring.

In planting, you must make the Hole according as the *Plant* is streight or bent: Those that are bent may be planted so as that one end may be even with the Earth, tho' I choose rather to let them



them be a little above Ground, for Reasons which I have not time to explain; but the streight are planted perpendicularly about a Foot deep in the Ground, and the holes fill'd with good Earth, after which they are ty'd to a Stick, and the first Winter should be cover'd with Straw. Thus they'll shoot both *Roots* and *Branches*.

By this Invention one may plant *Branches* and *Stocks* in abundance in *Gardens*, *Fields*, and on *Mountains*, and in little time they'll become perfect *Trees*.

§ 5. To conclude, I shall add here, that one may in the same manner raise quick-set Hedges of *Mulberry-Trees*, *White-thorn*, *Bullace-Briar*, *Holly-Trees*, &c. And in *Gardens*, *Espaliers* of *Filberd*, *Quince*, *Gooseberry*, *Rose*, and *Raspberry-Trees*, and the like, especially if planted in the Month of *October*, and kept all the Winter cover'd with Straw and Dung, for then they will shoot well.

P L A T E XXV.

Wherein is represented a Green-house, with a Repository or Nursery, in which I have planted some hundreds of Stocks dress'd with Mummy, which are kept there during the Winter.

(A. A. A. A.) *The length and breadth of my Green-house.*

(B. B.) *The boarded Floor.*

(C.) *The Trap-door to the Nursery.*

(D.) *A Ladder to go down by.*

(E.) *The Dung with which the Nursery is cover'd, that the Cold may not enter thro' the Joints of the Floor. For more safety I had before cover'd the Boards with Earth, and laid the Dung at top.*

(F.) *The Subterranean Nursery eight or nine Foot deep; at bottom there is a pretty thick layer of Horse or Cow-Dung, over which there is about three Foot of dry and prepar'd Earth. The whole dispos'd into several little Beds.*

(G. G. G.) *The several sorts of Beds in which the little Sets are planted.*

(H. H. H.) *The Ways to walk between the Beds when one would provide the Plants with Snow when too dry, and examine their State, &c.*

(I.) *Is a Bed wherein are several young Shoots and Stocks, of one, two, or three Years old, which are dress'd with Mummy.*

(K.) *Another Bed in which are several Branches of Apple, Pear, Apricot, Peach, Walnut, and Mulberry-Trees, which are bent, dress'd with Mummy, and planted in this manner.*

(L.) *Another Bed, in which are Sticks set up, and Laths nail'd over them, which make a kind of Support, according to (M. M.) The long Sets which could not be bent, are put pretty deep into the Earth, as far as they are plaister'd with Mummy, and then laid a-thwart the Laths that they mayn't be hurt.*

I might also have drawn the other Nursery which I have in open Air; but every body will comprehend by this what it is.

P L A T E XXVI.

Which represents the ordering of the Sets with Mummy, and planting 'em in Gardens, Fields, and on Mountains.

(A. A.) *The Master holding a long crook'd Branch in his Hand which is tied and dress'd with Mummy. This may serve to instruct Planters not to apply the Mummy too hot, which is of very ill Consequence.*

(B. B.) *Some large Branches fix'd to Stakes, in order to their being more firm in the Ground; this is of chief use in Fields, and on Mountains.*

(C.) *A large streight Branch which is so fix'd.*

(D.) *How a large Branch takes Root at the Joint, so that it begins to grow like a Stock.*

(E.) *A*

(E.) *A large Branch, in which one cannot discern any Joint, and which is cut only according to its Twigs.*

(F.) *The Fire.*

(G.) *The Kettle in which the Mummy is melted.*

(H.) *The Brush for plaistering the Sets, which must be made in a particular manner; for the Bristles must be tied in the Middle, and doubled, otherwise they fall and swim upon the Pitch.*

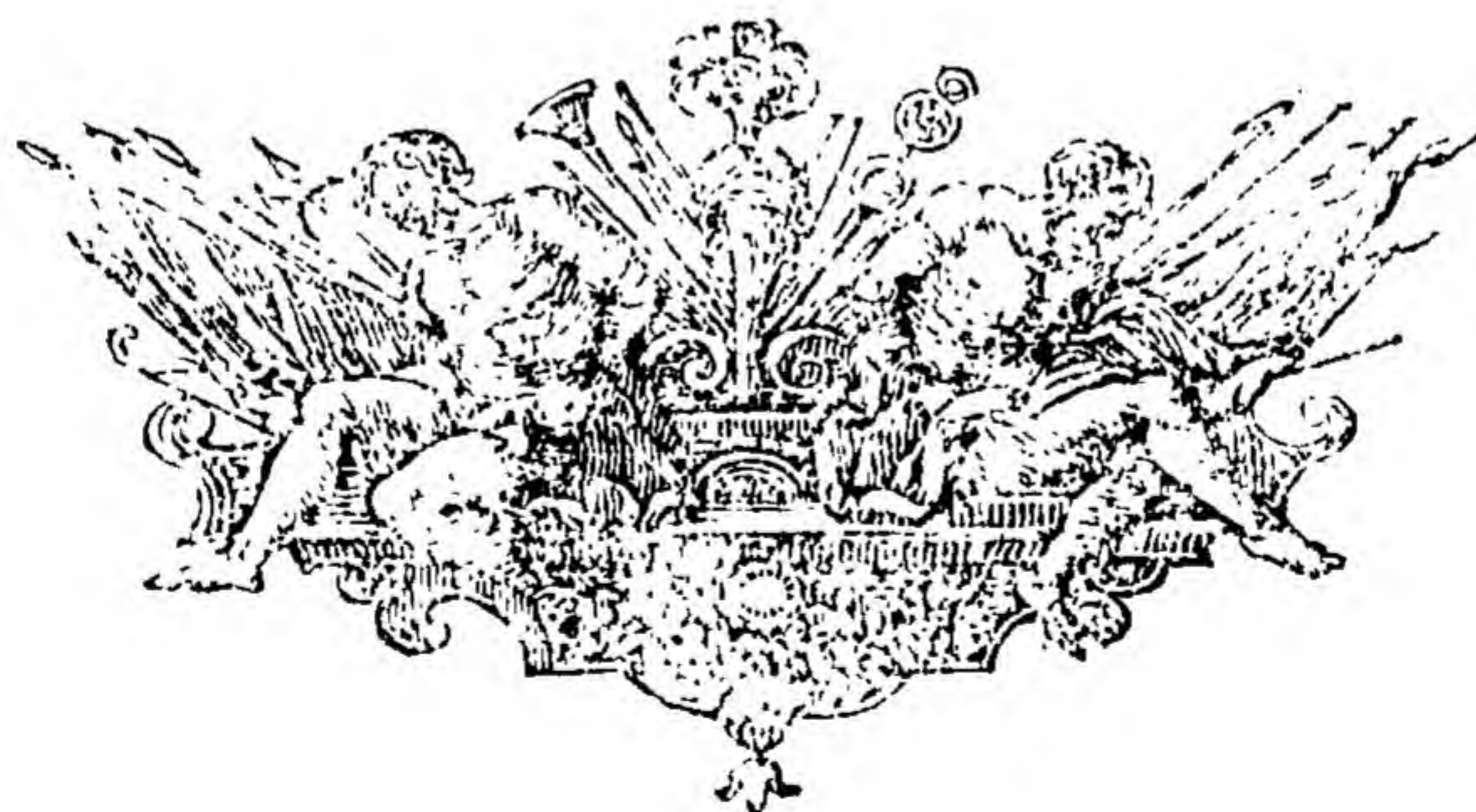
(I.) *Manner of plaistering the Sets with the Brush.*

(K.) *A Tub of Water into which the Plants are put to refresh them.*

(L.L.) *Shews some very long Branches of Pear, Apple, Walnut and Filberd-trees planted promiscuously in a Field, which appear like a little Wood.*

(M.M.) *The Manner of planting short Branches well dress'd or plaister'd; and how they sprout a Year or two after.*

(N.N.) *The like Branches of all sorts of Fruit-trees which are planted on Eminences and Mountains, where they spring up by degrees, and at length become great Trees.*



C H A P. V.

A new practicable Method of planting TRUNKS, BRANCHES and SHOOTs, in the room of fell'd WOODs, and in other void Places; which become TREES, and form a fine WOOD.

§ 1. **W**HEN we look into Authors who write concerning the Culture of *Woods*, we find they all unanimously agree they may be rais'd by the *Seed* of those *Trees* which are design'd to compose the *Wood*. Particularly what a certain noble Member of the laudable Society of *Gardeners* writes (of which we have already made mention in Part I. Sect. 2. and which must be approv'd of by every Body) deserves our Perusal. But as it must be confess'd, that the Culture and Growth of *Trees* this way goes on very slowly; and that on the contrary our Life is short, Men therefore endeavour to discover by Art something to expedite the Course of Nature, and procure for *Trees* their full Growth, without being oblig'd to wait so long for it. A certain Count, among others, has said by way of Complaint, that he thought it very strange there had as yet been no Body who had invented some other way than that of the *Seed*, for the raising of *Woods*, and filling vacant Places with *Trees*. This incited me to search into Nature, and find out some other Method of effecting it; and as my Mind then ran upon the Art of grafting the *Root*, (largely treated of in the First Part) I thought I had therein found this Method; but having put my Hand to the Work, I found a great many Difficulties in it; and tho' it may be executed, it being agreeable to Nature that the *Stock* and *Root* should unite one with t'other; yet in the Sequel it appear'd
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that this way was not proper for an *universal Propagation*. It then came into my Mind, that dividing the *Root* might be a fitter way. Filled with these Thoughts, and passing one Day thro' a *Wood* of *Firr-trees*, I observ'd that their *Roots* did not enter far into the Earth: In my way I met with an old Countryman, whom I asked, among other things, whether he had ever heard that the *Roots* of *Pine*, *Firr*, and the like *Trees* being cut to pieces and planted, would shoot up and produce *Trees*. The old Man, after having consider'd a while, reply'd, ' Sir, I still remember I ' have heard my Father tell, that the Lord of the Place once ' gave him a Piece of Ground, where a *Wood* had stood, to clean, ' in order to make it a good Field for Grain. The *Trunks* he took ' clean away, but ploughed the small *Roots* under Ground: The ' Land having been afterwards sown, the Year after, when it ' lay fallow, it produc'd abundance of *Firrs* and *Pine-trees*, which ' made a little Wood.' This Relation pleas'd me extremely, and coming to an Inn of the next Town, I told my Story to the Inn-keeper; some Countrymen who were present said they had never heard the like; ' But I know very well, said one of the Company, ' that when I was young, an old Neighbour of mine having lop- ' ped off some large *Stocks* and *Branches*, and replanted 'em, they ' grew,' which was a thing that surpris'd every Body. I ask'd him thereupon what *Trees* these *Branches* had been taken from, but he could not tell. This still encreas'd my Joy. Being come home, I turn'd over a certain ancient *Greek* Author, a Disciple of *Aristotle's*, where I found the following Words, which briefly comprehend the whole Art and Mystery of this Propagation. I shall for the present only recite 'em, without translating them.

Αἱ γένεσις τῶν δένδρων ἢ ἐκ τῶν ριζῶν ἢ ἀπὸ σπέρματος, ἢ ἀπὸ βίβης, ἢ ἀπὸ παραπαύσεως, ἢ ἀπὸ ἀκρίμαντος, ἢ ἀπὸ κλωνῆς, ἢ ἀπὸ ἄλλης τῆς ἐπιλεχθεῖσης, ἢ ἵππας ἢ ἄλλως κατασκευασθεῖς εἰς μικρὰ, &c.

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These Lines shall be clearly explain'd in the Third Part, which will treat of the Certainty and Verity of the Proposition; in the mean time I shall see whether this ought to be put in the Rank of learned Follies, as a certain merry Person pretends.

§ 2. Having now treated at large of my Proposition concerning the Method of raising a *Wood* from extirpated *Roots*, as well in the First as the Second Part of my Work; as also of the Method of effecting the same, by Cuttings, and by polishing the *Trunks*, I shall proceed in like manner to apply my last Proposition to a *Wood*, and shew how by cutting the *Joints*, and dividing the large *Branches*, one may raise a thick *Wood* in a short time.

§ 3. It is above all things necessary, that the Proprietor or Forester should know his Land well, and consider what part of the vacant Place was occupied by *Oaks*, *Firrs* or *Birch-trees*, that he may there plant the same kinds of Sets; but if Nature was used to produce all manner of *Trees* there promiscuously, he may imitate her, and replant all kinds of *Trees*; not doubting but that as the former *Trees* drew their natural Aliment from the Earth, these latter which are planted by Art will also receive their Nourishment from thence, and will take *Root* and grow.

§ 4. I have often said that Autumn is the properest Season for cutting the *Joints*; and since there sometimes happens foul Weather in that Season, so that one cannot conveniently work in the *Woods*, I think it best to build a slight Lodge cover'd with Boards, and carry thither the *Branches* and *Stocks* when they are cut, that so they may be kept dry and shelter'd from the Weather. One may also dig several Store-pits or Magazines cover'd with Boards, wherein to keep the *Roots* that have been dress'd with *Mummy*, till they can be transplanted: And if for any particular Reasons one had no mind to plant 'em, then they might be left there all the Winter, being dress'd in like manner with *Mummy*, and in the Spring they might be planted; but the place where
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the new *Wood* is to be, must be well clear'd from the *Stumps* and superfluous *Roots*. They who would plant the *Roots*, *Stocks* and *Branches* one among another, may do it. Besides, the Ground ought to be so dispos'd, as that one may dig deep Trenches wherein to set the *Plants* without much trouble.

§ 5. As to the cutting the *Joints*, and the *Flexure* or bending of *Forest-Trees*, it is perform'd in the same manner as we have directed with respect to *exotick* and *Fruit-trees*: Take for Instance a long *Branch*, and cut off all the collateral *Branches*, which serve in the same manner, and plant every one of them, in order to their producing so many *Trees*, as was shewn in the Plate which represents cutting in the *Joints*; when they are cut according to Art, they should be bent, if it may be done conveniently; but if they are too thick, they may be left as they are, and dress'd as is seen in Plate III.

§ 6. But since these high *Branches* may be damag'd by violent Winds or Storms, you may fix to 'em two good Supports, according to Fig. 4. and 5. They who drive Stakes into the Earth, and fasten the *Trees* to 'em, will have the Pleasure of raising tall streight *Plants*, which in time will be good *Timber-Trees*; but in these things every one may use his Pleasure. In this manner one may plant a great many thousand *Branches*, both streight and bent, in vacant Places, so as that in few Years there shall rise a fine and well order'd *Wood*.

§ 7. There remains something to be said of the large *Branches* or *Stocks*, in which one cannot find any *Joints*. It is certain that if I had not very good natural Reasons to perswade me, that a large and thick Piece of *Wood* may shoot; and if there had not been People above a hundred Years before me who thought it practicable, I should my self have believ'd that my Ideas were chimerical. But since this is founded on Nature and Reason, I shall publish my Thoughts concerning the manner of preparing long *Stocks*, whether of *Firrs*, *Birch-trees*, *Oaks*, &c. though
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they should be half as big as a Man: Take one of these large *Branches*, in which no *Joints* or Marks of Years are to be found; saw it off to the length of five or six Foot; make it smooth at both Ends with a Knife, and dress the Ends with *Forest Mummy*; but the End which goes into the Earth must be cover'd with the *Mummy* a Foot in length; then fasten Supports to it, either of the broad or the high sort. In soft Ground, where one may easily dig, the high are best; but where the Earth is hard the broad may be used. We cannot well determine how deep to set these *Stocks*, but two Foot, or two and a half, is sufficient.

As to the Manner of cutting the large *Branches*, since their *Joints* are not clearly distinguishable, it is done for the most part near the small *Side-branches*, (according to *k. k. k.* in Fig. 1. and 2.) for we see in most *Branches* that the little Sprigs shoot out just above the *Joints*; so that thus one may meet with the *Joint*, without knowing it.

P L A T E XXVII.

Represents the Manner of covering with Mummy the large Branches in which we find no Joint; and shews how to keep 'em in Winter in the Store-pit, and plant 'em when it is time.

(A.) *Represents the Store-pit in the Wood without a Covering, tho' for many Reasons it would be better it had a Roof.*

(B.) *Shews several Stocks and Branches order'd as they should be, and fast'ned to Pickets, so that they are ready for planting.*

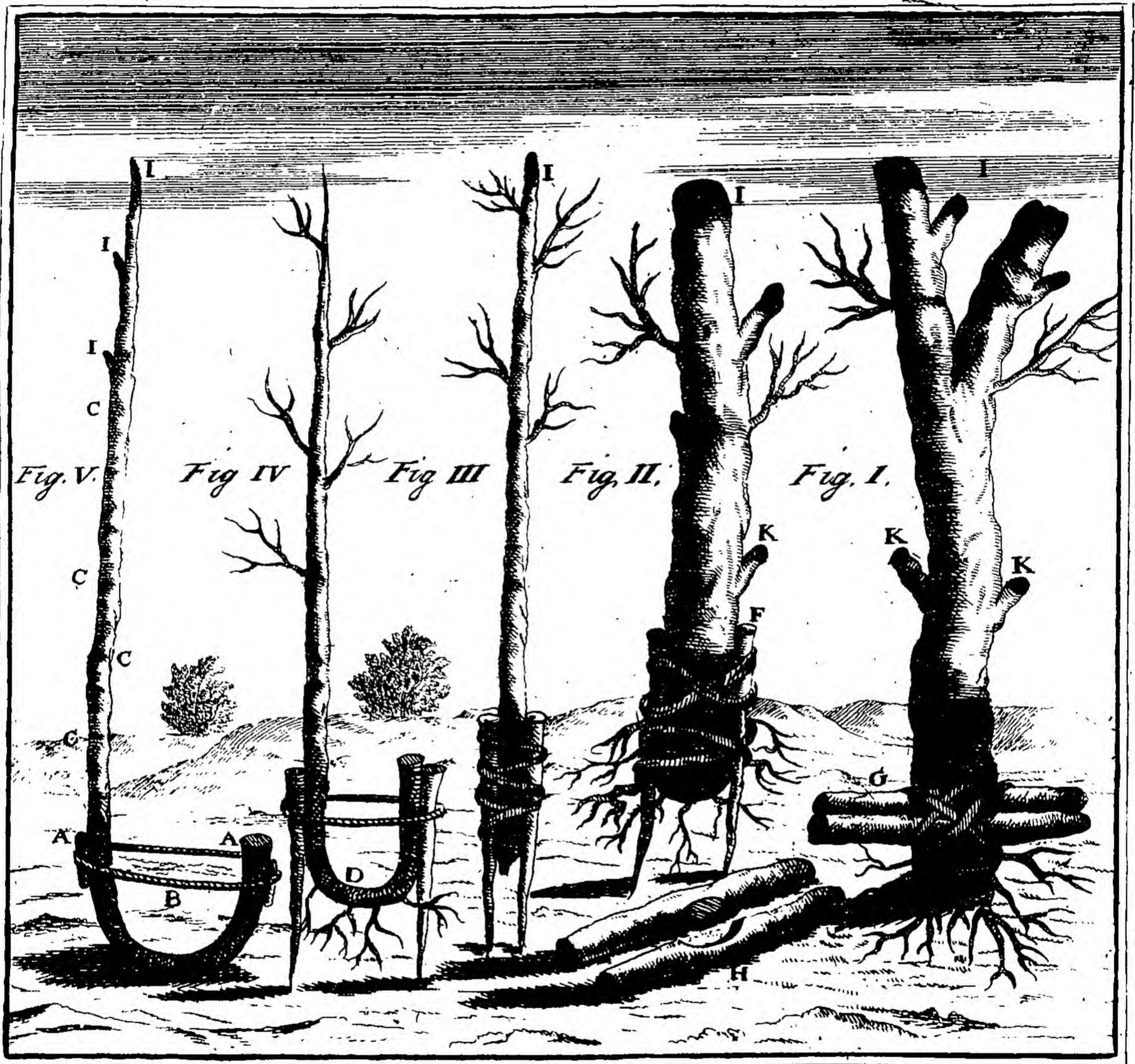
(C.) *A Labourer in the Wood, who makes the necessary Holes and other Dispositions.*

(D) *Are the Stocks planted regularly, and furnish'd with Earth.*

(E.) *Manner of pressing down the Earth.*

(F.) *Shews*





(F.) *Shews how this Operation is perform'd on Mountains, and all manner of Fruit-trees planted there; but how to order the Branches, and bend 'em, is what the next Plate shews.*

P L A T E XXVIII.

Which shews Foresters how to raise a Wood, by means of long Branches cut in the Joint, bent according to Art, and dress'd with Mummy; as also by the Means of Stocks half the thickness of a Man's Body, which being saw'd off to the length of five or six Foot, are cover'd with Mummy, and supported by Pickets.

Fig. I. *Represents a large Branch, in which no Joints could be discern'd; and which consequently was cut according to its Branches (K. K.) and then dress'd with Mummy at top and bottom; as also in all places where it was cut, as (I.) demonstrates. Afterwards it was fast'ned to Pickets set cross-wise, because the Earth was very hard.*

Fig. II. *Represents a large Branch without distinguishable Joints, and cut like the former, according to its Branches, as (K.K.) shew, which is fast'ned to long Pickets (F.), and cover'd with Mummy according to (I.)*

Fig. III. *Shews a long streight Branch, in which one may still discern the Joints; but which being too stubborn to be bent, is fast'ned to long Pickets; yet when the Earth is so hard, as not to be easily penetrated, such Branches may be supported by Pickets set crosswise, according to Fig. I.*

Fig. IV. *Is a long Branch, which being young is bent, and order'd as aforesaid. By this one may see how Branches take Root at the Joints according to (D.)*

Fig. V. *Is a long Branch, whose side ones, according to (I.I.I.) are cut off. (C.C.C.) shew the Joints, and (A. B.) the Ligature*

and manner of fast'ning the Bits of Wood, as also the Mummy. The same Method may be made use of for the midling and small Branches, as well as for the large.

These are my Thoughts concerning the raising of *Woods*.

CH A P. VI.

How by cutting the JOINTS one may plant new VINEYARDS, so that the VINES shall shoot the first Year, and bear GRAPES plentifully the second.

§ 1. **T**HE *Vine*, and the admirable *Liquor* it produces, which rejoyces the Heart of Man, have so many Uses and Charms, that they deserve to be amply treated of. As every one is convinc'd of this Truth, it ought to engage us to redouble our Efforts to propagate and encrease that happy *Plant* as much as possible. For this Reason, ingenious Persons have at all times applied themselves to find out Means of improving and multiplying *Vines*; and we must acknowledge to their Glory, that Posterity has not only reap'd the Benefit of their Inventions, but has been by that means the more excited to the Imitation of 'em. In order to new Discoveries tending to the Multiplication of *Vines*, his Majesty the King of *Poland*, Elector of *Saxony*, gave Order the 13th of *December* 1712, to all Proprietors of *Vineyards* in the Electorate of *Saxony*, to cultivate and improve them to the best of their Power. I should think my self very happy, if, as one of the least and meanest, I could contribute to the Execution of this Order, since I have had the good Fortune to reside several Years in the celebrated Universities of *Wittemberg* and *Leipsic*,

Leipfic, in order to pursue my Studies, where I receiv'd a great many Obligations, of which I render this publick Acknowledgment; and the rather, since his Majesty at my Request has been pleas'd to favour my Proceedings with his *Privilege*, for which I return him my most humble Thanks, wishing nothing more than that my poor Discoveries may be of some use to his Subjects. And as there is nothing more at liberty than Wishes and Thoughts, I shall communicate to the Publick my Thoughts concerning *Vines*, not doubting but God will add his Blessing. I shall therefore propose an infinite *Multiplication* of *Vines*, which has not yet been heard of, at least that I know.

§ 2. But first I must take a little Notice of the Method of Improvement practis'd by the Ancients: And we find what follows in *Columella* and *Palladius*. They who would improve *Vines*, need only pierce the *Stock* from beneath upwards, at a solid place, and there insert other *Sprigs*, so that each *Sprig* may fill an entire Hole; then the *Sprigs* are to be clean'd by taking off the thick *Bark*; but they must not be strip'd altogether, nor the *Buds* hurt. Then four Fingers breadth of the *Sprigs* is to be cut off at the upper End, leaving a *Bud* or two. Cover the *Incision* afterwards with Wax or Clay, and bind the whole gently with Bafs or slips of Linnen, that no Air nor Wet may get in. One may also cut the *Stock* first about a Foot above the Earth, and take the best *Branch* of the nearest *Vine*, and there insert it while the *Buds* are young and tender, and leave it thus two Years with the *Stock*, till it becomes accustom'd to the new *Sap*, &c. But because some Difficulties occurr'd in this manner of Improvement, our *Gardeners* begun of late to graff *Vines* in the *Cleft*, in the same manner as *Trees*, only differing in this, that the *Vines* being laid bare of Earth, the *Cleft* was made half a Foot, or something more, under Ground, Care being taken not to hurt the *Pith*, and two *Sprigs*, with the *Bark* turn'd outward, were grafted therein at once. Then they made the Ligature, as in the grafting of *Trees*, so as
only

only two *Buds* of each *Graff* might be above Ground, and the Hole was fill'd up. But as this manner did not please some, they thought of the following Invention. They made a deep and wide Hole about the *Vine* which they had a mind to graff on; then they took the *Twigs* by the ends, and having disintangled them, bent them upwards. Four Fingers breadth above the Sinuosity, and the depth of a Foot in the Earth, the *Branches* were cut clean off and split for the breadth of three Fingers, and a *Branch* cut point-wise at the end on both sides, fitted to them, so as that the *Bark* of the *Stock* and that of the *Graff* might be join'd; to which end it was also necessary that both should be of the same Thickness. Then the Ligature was made, and the Hole filled up, so that only two *Buds* appear'd out of the Earth, as may be seen in several Authors more at large. If it related to my Subject, I could add another rare manner of grafting on the *Stocks* of *Vines*, but I shall pass it over, and proceed to the *Multiplication* of them, to see how that has been hitherto treated, and what others say of it.

§ 3. They who have treated of the planting of new Vineyards say, that *Vines* may be propagated by the *Branches*, by the *Roots*, or by *Flexure*. As to their manner of propagating by the *Branches*, it differs from mine only, in that they do not cut 'em exactly in the *Joints* above and below, and that they do not dress 'em as they ought to do; for if they observ'd those two things they would have no reason to complain of the death of so many of their *Sets*. I shall take Notice here also of the Modern way of *multiplying* by the *Roots*, which consists only in buying as many *Stocks* with their *Roots*, as they have occasion for, and planting them to encrease their *Vineyards*. This is a sure way, and is liable to no Objection. As for their Method by *Flexure*, 'tis thus: Every Year they take some *Branches* of their most fertile *Vines*, and bend 'em down into a Trench which they have before made in the Earth, so as only two or three *Buds* appear
above

above Ground, then they fill up the Hole, and leave 'em thus for two Years, till they are in a manner wean'd from the Mother, and receive their Nourishment immediately from the Earth. But as soon as they take *Root*, they cut 'em off and transplant them. And thus one may acquire young *Vines* of the best sort, &c. This is what I have found in Authors concerning the Propagation of *Vines*. I now proceed to my Method of *Infinite Multiplication*.

§ 4. To attain this end, the use of the *Seeds* or *Grape-stones* is certainly the surest way, and that which produces the greatest quantity of *Plants*. Some will look upon this as antiquated, and too common: This Objection may indeed be made, but hitherto no body has practis'd the Method, that I know of. For when the *Wine* is press'd out, what remains is generally thrown away, as of no use. Yet it can't be denied but God himself has reveal'd to us this natural way, and there is no doubt but *Noah* and the *Patriarchs* multiply'd their *Vines* by the *Seed*, as I have shewn in the second Chapter of the second Section. Now since what is old must again become new, I shall recommend this manner very seriously. I flatter'd myself with the hopes of sowing a whole Field with this *Seed* last *October*, but to my great disappointment the *Grapes* did not ripen, so that I was obliged to defer my Design till next Autumn, when I intend to put it in practice, if it shall please God. I have in the first Part clearly set forth the manner of doing it, and doubt not but if duly executed, it will produce still a greater quantity of *Vines* than has been said. But some People may endeavour to oppose this Design, by saying we have wild *Stocks* enough already, so that such a Work is but loss of time: But without condemning me so hastily, be persuaded that among the *Seed* there will often be found excellent *Vines*, and such as may not easily be found elsewhere: And supposing it only produc'd common *Stocks* at worst, they may be improv'd in a little time, by what we call *Embracing*, so as the
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Proprietors will reap no little Advantage by it. Go to work only, and in a short time you will have reason to thank God for the plentiful return of your Labour.

§ 5. Tho' this Propagation by the *Seed* was ordain'd by God, as the best and most productive, yet by Art, Care and Pains, very much may be contributed to the more speedy Growth. Now as some People have attempted the cutting of *Branches* in order to a *Multiplication*, I shall propose here my manner of *Amputation* in the *Joints*, which I made Proof of on my *Vine* that is fastened with Laths; which was thus. Towards the End of *October*, when the *Leaves* were fallen, I cut off the long *Branches* all to three *Buds*, but I took off the upper small *Sprigs* of 'em, (which the Ancients called *Flagella*, that is *Rods* or *Twigs*) as being too tender, and not capable of bearing the rigor of Winter. When I had got a sufficient number of *Branches*, I cut a long one into four, five, or six *Sets*, so as that one had two *Buds*, another three, as I thought fit, always taking care to cut it in the *Joint*. In this manner I obtain'd a great Quantity. Then I heated the *Forest-Mummy* a little, and after it was grown somewhat cool, I cover'd the *Vine-Branches* more than a third part with it, above and below. I planted some of them in my *Garden* along the Walk in Beds prepar'd for that purpose, and some I put into my Repository, to see which would shoot best the next Spring. And for my more convenient planting 'em, I procur'd a *Garden-Augre* pointed at bottom, and round at top like a Carpenter's Wimble, of the length of two Spans and a half, with a large Cross-handle. And that I might have of all kinds of these Instruments, I caused several to be made for me of *Oak-Wood*; when I had made the Holes with these in the Earth, I plac'd therein the *Vine-Branches*, which were cover'd at the Ends with *Mummy*, so as that two *Buds* were under Ground, and the third above; after which I fill'd up these Holes with good Earth, and when the cold Weather approach'd, I cover'd 'em
with

with Straw; for thus they may remain all Winter without any Damage.

§ 6. I know it is contrary to the Rules of *Vine-dressers* to prune 'em towards the end of *October*, and therefore we must wait till the Month of *March*, which is the Season for pruning; let it be so then, and when that time comes, proceed with me in the following manner. When the *Vines* are cut, collect all your *Cuttings*, and if you can't get enough from your own *Vineyard*, you must endeavour to procure 'em from others, where they may be best spared, such as grow by the sides of Houses or in Gardens, or in the dry Ditches of fortify'd Towns, and these are generally the finest and most excellent.

§ 7. When you have collected a sufficient quantity of *Sprigs*, if the Weather is favourable, you must begin your Work in the following manner, according to *Plate 28*. In the first place, you must take care to make use of such Persons as understand the cutting of *Vines* in their *Joints*, which must not be done a-cross or obliquely, but in a direct Line, and to each *Joint* about an Inch of the Wood must be left above and below, according to (*A. B.*) Then observe whether the *Sprigs* are long or short, and have much of the old or young Wood; if they have a great many *Buds*, you would do well to cut away all to three; for if you set 'em with two or more *Buds* under Ground, 'tis so much the better; but if they are short, you may cut away all but two, one of which must be within the Earth, and the other above. If there is much of the young Wood, which is easily to be seen, you may venture to try whether they will shoot or no. The *Sets* being thus gather'd and order'd, the *Gardener* dresses 'em in the following manner.

§ 8. When the *Forrest-Mummy* has been melted gradually over a slow Fire in an Earthen or Copper-Pot, according to (*D.*) he takes it from the Fire, and lets it cool till it has done exhaling any Vapours; then he dips both ends of the *Sprigs* in the cool'd

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Mummy,

Mummy, which done, he lays them by on the Ground to grow cold. But if the *Mummy-Pot* cools too fast, he sets it again on the Trivet, filling it with fresh Pitch, and blowing up the Fire. The reason of dressing the *Sets* in this manner with *Mummy*, is to preserve 'em from any damage thro' the moisture of the Earth.

§ 9. Before this is done, you must clear the Ground where you intend to plant your *Sets*, the manner of which is sufficiently known, *viz.* You turn the Earth up with your Spade to the depth of a Foot and half, so as the upper Mould, which is always the best, may lye underneath and receive the *Root* of your *Plant*, and the lower being rais'd above, may be soft'ned and mellow'd by the Sun and Weather; then with your *Hoe*, you take away the Stones and other Impurities. When this is done, and the *Sets* are prepar'd, you plant 'em in a streight Line or Lines, about half a Foot from each other; for thus, if they should shoot out too fast, the second or third Year you may easily remove some of 'em, and transplant 'em; but before you plant your *Sets*, you must make Holes for them in the Earth with your Augre (*I.*) in which you must place 'em perpendicularly, and not length-wise, according to (*K.*) after which you must fill up the Holes and press down the Earth very close.

§ 10. In planting new *Vineyards*, it is necessary to provide a proper place; and especially care is to be taken that the *Sets* be planted in a fat and fertile *Soil*; and if one can light on a place which is not too much expos'd on all sides to the Rays of the Sun, 'tis so much the better; for it is to be fear'd, that where the Ground is clayish, and the Sun is too powerful, the *Sap* of the *Sets* will dry up before they can take *Root* by the *Joints*, which Disappointment may be impertinently ascrib'd to a defect in the Art itself. If it be possible, 'tis best to plant such *Vineyards* towards the East. But this is left to the Discretion of the *Planter*, who
to

to be sure will make an exact Inquisition into every thing, before he undertakes a Work so expensive.

§ 11. A Propagation by parting the *Root*, is perform'd in the following manner. You cut the large *Roots* into Pieces, and when you have dress'd 'em with *Mummy*, you plant 'em according to Art, and these in due time will shoot out with young *Stocks* or *Branches*. This way certainly was never thought of before, much less has it been practis'd. Yet I have made the Experiment, and found such good Effects of it, as will be very agreeable to whoever undertakes it.

§ 12. But perhaps it will put us to some trouble to find *Roots* enough for a *Vineyard*, without prejudicing our *Vines*. The best way to avoid this, is to make use of the shaken *Roots*, which are cut away in Autumn; and to procure all we can from our Neighbours. When the Collection is made, it is best to keep 'em in some Cellar, Ditch, or other place, that the Air may not dry 'em, especially when the Season is not proper for dressing them with *Mummy* and planting 'em; but as soon as the Weather becomes clear and dry, we may go to work in the following manner. First we may cut the *Roots* into Pieces of a little more than a Span's length, sometimes a little less, and this ought to be done directly up and down, and not obliquely. The *Roots* being cut, they are laid by one another in such a manner, as that we may distinguish the upper end from the lower; but tho' one should by chance mistake, they may be planted, for they will shoot, tho' in a reverse manner, as has been said of the *Sets*.

§ 13. When a sufficient quantity of *Roots* is thus cut, we take the Pieces and dip both ends in the *Mummy*, the lower end something deeper than the upper, and having made holes in the Earth with the Augre, we plant 'em so as that a little of the *Root* appears out of the Earth; which done, we fill the holes with good Mould, and press it well down. In this manner they will shoot the next Spring, and become good *Vines*. But as there are some who desire

till Spring the cutting of their *Vines*, it may be queried, whether this Work can be done then; I answer it may, but then their Growth is slower, and there will more fail than if it had been done in Autumn; in the mean time I am fully persuaded, that if they do not all shoot, at least the greatest part will. The Autumn is the best Season for them, for then in the Winter no *Root* is spoil'd by the Frost.

§ 14. There is another Question to be propos'd, which is, Whether these *Sets* and *Roots* of *Vines* will bear as good *Grapes* as the *Vines* they were taken from, and as plentifully? I answer, that I can't be positive of that, but I don't know any reason why they should lose their Virtue for being dress'd with *Mummy*, since we see that a *Graff* which is inserted in another *Stock* preserves its proper Nature and Goodness; and I don't doubt but these will do the same. But Experience will soon instruct us.

Having said enough for this time of the *Multiplication* of *Vines*, I pass now to Exotick *Fruit-Trees*, and shall propose on this Subject, several extraordinary manners of Operation.

P L A T E XXVIII.

New Methods of planting Vineyards, by cutting the Twigs, and dividing the Roots, so as they shall shoot the same Year, and the next shall bear Fruit.

(A.B.) *Manner of cutting the Sets in the Joint.*

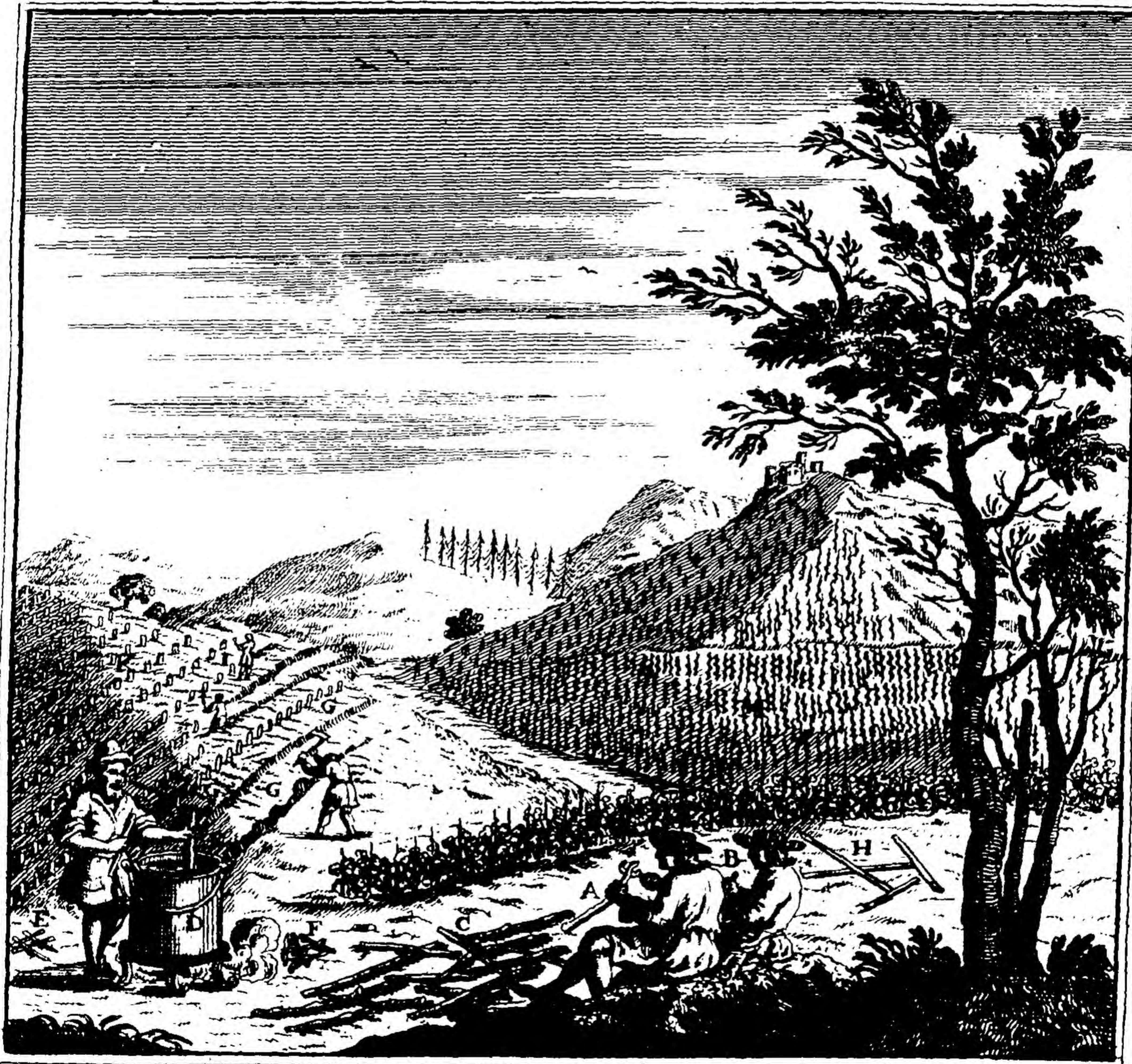
(C.) *Heap of Twigs which have been taken from Vines, and are to be cut in the Joint.*

(D.) *The Copper-Kettle fill'd with Mummy, which is melted slowly, into which the Cuttings are dipped according to (E.)*

(F.F.) *How the Sets are put in order after they are dress'd with Mummy, that the upper end may be known from the lower.*

(G.) *Manner of preparing the Ground that the Sets and Roots may be planted according to Art in the broken Earth, which is first smooth'd.*

(H.) *The*



(H.) *The Augres, with which the Holes are made for planting the Sets and Roots.*

(I.I.) *The Labourers who make the Holes, plant the Sets, and cover 'em with good Earth.*

(K.) *Vineyards planted after the new Invention.*

(L.L.) *Represent those Parts of the Vineyard which are least expos'd to the Sun, wherein the Sets and Roots are planted, which receive a great Advantage, and grow a-pace from the Effusion of the Water, which is pour'd from the Castle on the Mountain.*

(M.) *Shews the Profit the Proprietor receives from his Labour, (even a thousand for one) as well by sowing the Grape-stones, as by setting the Cuttings and parted Roots.*

CHAP. VIII.

A new and singular manner of uniting several BRANCHES, by means of the Art which I call Embracing, whereby one may produce different FRUITS from the same TREE.

§ 1. **I**T may justly be said of Lovers of Gardening, that they are in the same Condition with those who give themselves up to *Chymistry* or *Alchymy*; they are both equally eager to discover the most occult Secrets of Nature, and labour with so much Assiduity, that they seem to be her Masters; when at last, by a Disappointment, she shews them the quite contrary.

§ 2. What is said of a seasonable Rain which moistens the Earth, and causes it to bring forth all manner of *Plants*, may as well be said of the Gift of Invention, on account of the Variety
it

it produces. This appears particularly in that, on occasion of cutting the *Joints*, we have discover'd a very pretty Union, by means of what we call *Embracing*. It may be perform'd in three different Manners, either by the *Branches* which are only cut in the Joint, or by those *Branches* which have first acquir'd *Roots* by the Art of grafting the *Root*; or lastly, by such *Branches* which are not cut from the *Trees* till after they have shot forth *Roots*; as will appear more at large by the Sequel.

§ 3. As to what concerns *Branches*, which are united after cutting the *Joints*, by means of what we call *Embracing*, it has been explain'd in Part I. Plate 8. Sect. 3. to which I refer my Reader. This being premis'd, I pass to the Thing it self without any Digression: I take in Autumn or in Spring, (but in this latter Season the Success is less certain) I take, I say, two sound and streight *Branches*, which have shot well, equal in length and thickness, and cut them in the *Joints* in the manner before described, discharging them at the same time of all collateral *Branches*, according to Fig. 1 in the annexed Plate. But this Conjunction is better explain'd in Fig. 2. (*A.B.*) in Fig. 1. and (*C.D.*) in Fig. 2. represent the *Branches* which are cut off at bottom in their *Joints*, and accommodated with *Mummy*. By both these Figures it appears that a little of the *Bark* on the Inside of each *Branch* is cut away, even to the *Wood*; which being done, I put 'em one upon another in the same manner as two Hands are joined, and bind them with *Bands*, according to (*F.*); then I put little Pieces of *Wood* between 'em above and below, to hinder them from growing together, and to cause 'em to shut the closer, according to (*G.*); then I cover the Incisions with *Mummy*, make the *Ligature*, and fasten the Props according to (*K.*) Afterwards I carry 'em to my *Repository*, and the next Spring plant 'em; and thus they not only take *Root* at the *Joint* according to (*I. I.*) but by means of the callous Matter unite with each other; and this is what is call'd single *Caressing*. They who have a mind to double it, may do it very conveniently, as they shall think fit.

§ 4. I shall now proceed to shew how by the Means of what we call *Embracing*, one may unite two, three or four *Branches* at a time, according to Fig. 3, 4, 5. which *Branches* must be cut in the *Joint* in the same manner as in Fig. 3. and 4. Fig 5. represents the Incision, and manner of uniting two, three or more *Branches* by the *Embrace*. For Example: Take two *Branches* and put them cross-wise one upon another, mark the place where they join with Chalk or the like, and upon that Mark make a Notch in each *Branch* a third part thro' the *Wood*; then tie and dress 'em with *Mummy*. The same Method is to be used in joining three together by the *Embrace*; to this end you take the largest and strongest *Branch*, and cut it in the aforesaid manner before and behind, according to (L.) in Fig. 3. The others you only cut on one side, as is shewn by Fig. 4. When the Incision is made (which is best perceiv'd by the Mark before spoken of) you place the *Branches* so as that the biggest *Branch* stands upright in the middle, and the other two cross-wise upon it; after this they are dress'd with *Mummy*, tied and fastned to Props. In this manner the *Roots* will shoot out from all the *Joints*, and the Incisions will unite perfectly, and be cover'd with a callous Matter. They who would join five *Branches* together, may easily learn to do it by Fig. 4. and 5. for (M.) represents a large *Branch*, in which two Notches are made, both before and behind, the one above and t'other below; and (N. N. N.) are the other *Branches* which are cut only on one side, and are inserted in the Notches of the large *Branch*, which they fit exactly with; afterwards they are tied, carefully dress'd with *Mummy*, and supported with *Pickets*, according to (O. O. O.) in Fig. 5. If they are put in the *Repository* during Winter, and are taken good Care of, they will shoot out *Roots* from all the *Joints*, and sprout according to (P. P.)

§ 5. As to the *Branches* which are already grafted upon *Roots*, and are by that means become *Trees*, they have much better
and

and surer Success, provided they are cut in their *Joints*; the Reason of which is easily guess'd at. Such *Branches* are united in two different Manners, *viz.* either by *Caressing* or *Embracing*. Fig. 6. shews what *Caressing* is, *viz.* you cut a little of the *Bark* and *Wood* off each *Branch*, that they may fit exactly one to t'other, according to (Q.) but the Incision must be made above the *Root*, (as R. R. Fig. 7. represent.) When this is done, you tie the *Branches* one to another, dress 'em with *Mummy*, and for more Security fix 'em to Props. When one would join three or four *Stocks* full of *Knots* of *Roots* together, the Incisions must be made according to Fig. 8. Fig. 9. shews the Place and Manner of the Juncture, and how to fix the *Pickets*. This being well executed, one may be pretty sure they will soon take *Root* through their *Callus*, according to (S. S. S.) They will also bear *Fruit* the second or third Year, which is very agreeable, especially when *Branches* of different kinds of *Fruits* are united together.

We are now to explain the manner of uniting the *Branches* of different *Fruit-trees*, by *Embracing* and *Caressing*, so as that each *Branch* may remain on its proper *Tree* without cutting off. This way is very easy and pleasant: You plant an *Orange* and a *Lemon-tree* close by each other; or else a *Citron* and *Lemon*, according to your Fancy; or even, if you will, four different sorts; for Example, an *Orange*, a *Lemon*, a *Citron*, and an *Adam's Apple-tree*; you chuse those large and sound *Branches* which you have a mind to marry, and prune off all the collateral *Twigs*; which being done, you cross 'em one over another to see how they will fit; then having made your Incision on each, you bind and dress 'em with *Mummy* as before directed, according to Fig. 10. but especial Care must be taken that the *Mummy* be not too hot, for then you damage your *Trees*, and spoil the whole Work.

§ 7. Care must be taken not to join *Branches* together which are not of the same Nature, or have not some Affinity one to t'other. It succeeds well when *Peach-branches* are united with *Plum-branches*, sweet *Cherries* with *Merises* or *Griotes*, large and small *Pears*, and all sorts of *Apple* and *Pear-trees* together. But whoever should join *Apricots*, *Nuts* and *Apples*, would make but an ill Mixture. As to those who are willing to have the Pleasure of seeing the Marriage of a *Laurel* and *Pomegranate-tree*, &c. or several sorts of *Pinks* or *Roses* growing on the same *Branch*, or all kinds of *Grapes* on one *Stock*, they may exercise themselves in this Operation. Such pleasant Fancies I leave to Curious, to whom I have given the foregoing Directions.

P L A T E XXIX.

Shews the manner of joining three or four different Trees together, by what is called Caressing and Embracing, which produce at the same time several sorts of Fruit.

Fig. I. (A. B.) *Two Branches cut in the Joint, and dress'd with Mummy.*

(C.) *The Union, which is called Caressing.*

(H. H.) *Shew how they are tied and dress'd with Mummy, and fasten'd to Pickets; and (I. I.) how at length the Roots shoot out of the Joint.*

Fig. II. (C. D.) *For better Explanation represent the two Branches dress'd with Mummy.*

(E. E.) *Their close Union.*

(F.) *Shews what Care must be taken as to the Mummy and Ligature.*

(G. G.) *Are the little round Bits of Wood which are put between, to keep the Branches separate above and below the Joint.*

Fig. III. *Three Branches cut in their Joints, and united by the Embrace.*

(L.) *The middle Branch, into which the other two are inserted.*

Fig. IV. *How five Branches, which are cut in their Joints, may be united by the Embrace.*

(M.) *The biggest Branch, which is cut in four places, twice before and twice behind. (K. K.) and (N. N.) serve only to shew the Incisions in the Branches, and how they are cut from right to left.*

Fig. V. *Shews the five Branches united and dress'd with Mummy, &c. as also how they shoot Roots at and near the Joint.*

Fig. VI. *Manner of joining Branches by the Carefs.*

(Q. Q.) *The Cut which is made direct and smooth.*

Fig. VII. *Two Branches full of Root-knots, which are united by the Carefs, and are tied and dress'd with Mummy, according to (R. R.)*

Fig. VIII. *The Incisions for joining together several Branches full of Root-knots.*

Fig. IX. *The united Tree, how it takes Root, and afterwards bears several sorts of Fruit.*

Fig. X. *An uncommon Union of four different exotick Trees, viz. an Orange, (T.) Citron, (V.) Lemon, (W.) and Adam's Apple, (X.) the Branches of which are so united by the Embrace, that one may see at the same time upon an Orange-tree, Citrons, Lemons, and Adam's Apples, or, vice versa, on either of the other Trees, four several sorts of Fruit.*



C H A P. VIII.

A new Proposition for raising Dwarf TREES from little BRANCHES of TREES, which are hardly the length of one's Finger, and yet are sometimes six, seven, ten, and even eighteen Years old.

§ 1. **I**F it be true, that all the Creatures testify of the Almighty Creator of Heaven and Earth, certainly the Testimony of *Plants* is none of the least considerable, since they represent to us the unsearchable Wisdom and Power of God, as clearly as any others of his Creatures. And I am perswaded, that tho' a Man should attain the Age of *Methusalem*, and pass his whole Life in nothing but Speculations on *Plants*, he would not be capable of acquiring a perfect Knowledge of their Natures, Virtues, and wonderful Qualities.

I shall only instance in a sort of little *Twigs* on *Apple* and *Pear-trees*, which, tho' seen by the Curious every Day, yet no Body has discover'd what was the Design of Nature with regard to those little *Branches*, which are furnish'd within with so great a number of little Points. There are many other things which I have taken notice of in *Trees*, which none ever thought of, but which I pass over in Silence for certain Reasons. In the meantime I shall freely communicate what I have discover'd concerning these little knotty *Branches*.

Walking one Day in the fine *Garden* of the Monastery of *Priessing*, I was in a deep Meditation on the *Essence* of *Trees*, and the most probable Method of discovering it. Reflecting on a great many things, I by chance cast my Eye on abundance of little knotty *Branches* of *Apple*, *Pear*, *Cherry-trees*, &c. which

(L.) *The middle Branch, into which the other two are inserted.*

Fig. IV. *How five Branches, which are cut in their Joints, may be united by the Embrace.*

(M.) *The biggest Branch, which is cut in four places, twice before and twice behind. (K. K.) and (N. N.) serve only to shew the Incisions in the Branches, and how they are cut from right to left.*

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I shall only instance in a sort of little *Twigs* on *Apple* and *Pear-trees*, which, tho' seen by the Curious every Day, yet no Body has discover'd what was the Design of Nature with regard to those little *Branches*, which are furnish'd within with so great a number of little Points. There are many other things which I have taken notice of in *Trees*, which none ever thought of, but which I pass over in Silence for certain Reasons. In the meantime I shall freely communicate what I have discover'd concerning these little knotty *Branches*.

Walking one Day in the fine *Garden* of the Monastery of *Priestling*, I was in a deep Meditation on the *Essence* of *Trees*, and the most probable Method of discovering it. Reflecting on a great many things, I by chance cast my Eye on abundance of little knotty *Branches* of *Apple*, *Pear*, *Cherry-trees*, &c. which

appear'd as if press'd together, being of the length of one's Finger, and about the same bigness. After having examin'd them a little, I took off one, and considering it, I assur'd my self that it was as a *Reserve* to the *Tree*, which, in case of Necessity, would produce nine, ten, fifteen, or even twenty others.

§. 2. Having a long time examined one of these little *Twigs*, and counted all the *Knots*, I split it length-wise, and found within it as many *Points* as there were *Knots* without; these I took for so many *Years*; and the better to penetrate the Matter, I sought for the like *Branches* in several of my old *Apple* and *Pear-trees*; and having found of 'em, I saw'd a long *Branch* thorow, (according to the Letters *A B*. in Fig. I.) I cut away all the larger *Side-branches*, so as that some little knotty *Branches* still remain'd; I then examin'd whether the number of *Knots* or *Years* agreed with that of the *Branches* on which they were placed, and at the first *Joint* I found only simple *Buds*, which had no Elevation. At the second *Joint* the *Buds* were more elevated, and having split one of 'em length-wise, I found a large *Point* which corresponded with the exterior *Knot*; and since there was another pointed *Bud* upon it, it was easy to conclude that it was entering into its second *Year*: this was confirm'd, because there was one likewise upon the other *Joint*. I proceeded further to consider the third *Joint*, and there belonged to that also a like little knotty *Branch*, with two other *Knots*, and a little *Point* above; I took this off, and having split it as the former, I found in it two large *Points*, making with the other three *Years*, as the third *Joint* confirm'd; I did the same by the fourth, fifth and sixth, and always found as many *Knots* without as there were *Points* within, and as many *Years* as could be counted on the *Joint*, over which the *Branch* was placed. This exact Conformity confirm'd my Assertion, that it was a singular Art to know the Age of the *Stock*, by distinguishing the long *Branches* from the short; tho' it often happens that we find the like little knotty *Branches* on the sixth
or

or seventh *Joint*, or Year, which yet are but three or four Years old: But this proceeds from the old *Branches* being broken off, and these young ones coming in their room. If therefore one would judge of these rightly, one must proceed with Care, and examine the *Branches* and *Joints* leisurely in their Order. But this may suffice as to the Certainty of distinguishing the Years by those little knotty *Twigs*.

§ 3. Having finish'd this Speculation, I was curious to know whether all the intermediate Knots would produce *Branches*; to this end I grafted some of these little knotty *Twigs* of seven, eight, nine, or more Years old, on *Stocks*, and found it to succeed to my great Satisfaction, which furnish'd me with a great many pleasant Idea's relating to the Cultivation of little reverse *Trees*, of which we have made mention in the first Part.

§ 4. After this, being employ'd in cutting *Branches* in the *Joints*, one of these little knotty *Branches* came by chance into my Hands: upon which I had a mind to try, whether by dressing such *Branches* with *Mummy*, one might not cultivate *Dwarf-trees*; to this end I return'd to *Priesling*, and obtain'd Leave of the Abbot to take off some of these knotty *Twigs*; (for I may say, I never found any so large elsewhere, and they are here drawn in their full Proportion) I pass'd my Time with a great deal of Pleasure in examining them within and without; I had one, among others, on which I could distinguish on the Outside nine little Knots, according to Fig. 5. this *Twig* I split, as in Fig. 4. and found at every Separation a Speck, and therein a little Point; such a Knot is the Work of Nature in one Year, consequently there is in each a Principle of Growth, which is the Reason, that from every little Knot there may proceed *Roots* and *Branches*, as we shall yet shew more at large. As I am now speaking of the Inside of these *Branches*, I can't forbear mentioning a little knotty *Branch* of a *Cherry-tree*, in which I could perfectly see the Points or Marks of Years. This little *Branch*, which
was

was not bigger than is represented here, Fig. 6. was nine Years old, as I observ'd with Pleasure.

§ 5. I made this little *Branch* with some others smooth at bottom; after which, I dipped 'em all but two Knots in the *noble Mummy*, and propped 'em with little Sticks tied with *Bass*; then I set them in a hot Bed in my Stove; and now, while this Book is printing, they begin already to bud, and in a little time will take *Root*, having now a *Callus* at bottom; in process of Time, I hope they will appear in the same manner as Fig. 2. represents.

§ 6. I cannot positively tell whether one may cultivate the like *Dwarfs* from *exotick Trees*, such as *Orange*, *Citron*, &c. for as yet I have not had Opportunity to make the Experiment. But they who have old and tall *Orange-trees*, may examine whether such little old interwoven *Branches* may be found on them; which I very much doubt; for as far as I have been able to observe in so short a time, they are no where in greater plenty than upon *Apple*, *Pear*, *Cherry*, *Chestnut*, *Walnut*, and *Apricot-trees*, neither are they so long, nor so knotty upon these last, as upon the others. In the mean time, any curious Person who takes Pleasure in such things, may search further into this Affair; and I don't doubt but there are many other Discoveries to be made, which have escap'd me.

P L A T E XXX.

Which shews in a little Branch the Omnipotence of God, and that things of the greatest Consequence may long remain conceal'd from us. This Discovery may give occasion to the raising of Dwarf-trees, which will bear Fruit in a short time.

Fig. I. (A. B.) *A long Branch of a Pear-tree, with all the Side-branches cut off, according to (c. c. c.) This Figure shews in the first place the joints on the Stem, as they have been already represented in the principal Plate, which shews the manner of cutting*

ting in the Joints. It likewise represents the Buds which grow one upon another over the Joints, and become at last so many little Branches full of Knots, as 1, 2, 3, 4, 5, 6. The first Bud has no Knot nor interior Point, because it grows flat upon the Branch; the second has a little Knot and an interior Point, with a Bud over it, which shew it to be two Years old; the third has two Points within, and two Knots without, with a Bud, and is three Years old; and so of the rest.

Fig. 2. Represents a little knotty Branch, provided with all that is requisite, which has taken Root after having been sometime in the Ground, and begins already to shoot between all the Side-buds.

Fig. 3. Represents the true Length and Thickness of such little knotty Twigs, and how they appear naturally together, with their Age, and how they are dressed with Mummy and propped up.

Fig. 4. Another little Branch of nine Years old, as may be seen as well by the exterior Knots as by the interior Points.

Fig. 5. Another such Branch with its Knots, represented in its natural Length and Thickness, as it came from the Tree; as many Knots as it had on the Outside, so many little Points there were within.

Fig. 6. Shews a diverting Experiment made with a like little Branch of a Cherry-tree. It was just of the Size of the Figure, yet was nine Years old. When it was split in the Middle, one might distinctly discern the nine little brownish Points, which Sight was very surprising to all the Spectators.



S E C T. II. P A R T II.

C H A P. I.

Which shews how, from the cut BRANCHES being bent in the JOINTS, tied and dress'd with Mummy, and then planted the reverse way, one may raise odd-shap'd and monstrous TREES.

§ 1. **I**T must here be premis'd, that I do not mean any deform'd Growth, much less real Monsters, but only such strange and odd Shapes, as may be produc'd for Variety and Pleasure, in which, tho' we do Violence to Nature for a while, yet by little and little they return to their true Form.

§ 2. 'Tis no impertinent Question to ask here, Whether this Operation may be perform'd upon the *Branches* of *Exoticks*, as well as those of our own Growth? There is no reason to doubt it; but I am of Opinion that it succeeds best, when practis'd on *Fruit-trees* and *Vines*. Experience will soon make the Discovery. And, if God permit, I shall communicate whatever Observations I shall make concerning the Truth and Certainty of what has been advanc'd. I have already made several Experiments on the *Branches* of foreign *Trees*, as well *Orange* as *Laurel*, which I perform'd in the manner following. After having stript the *Branches* of all the *Leaves*, I bent and tied them in several Manners, dress'd 'em with *noble Mummy*, and then planted 'em the reverse way, so that nothing was to be seen of all the *Branches* but the great Ends. Thus I have kept 'em this Winter in my Stove, and next *May* will shew us the Success.

§ 3. They



§ 3. They who desire to raise all sorts of monstrous *Fruit-trees*, such as *Apple, Pear, Cherry, Peach, Apricot, Mulberry, Walnut-trees, &c.* or *Shrubs*, such as the *Rose*, the white *Gooseberry-bush, &c.* need only take several *Branches*, furnish'd with long *Side-branches* or *Twigs*, (according to *A.* in Fig. 31.) and plant 'em the reverse way, so as that the great Ends may stand upward, as in the Figure; then they must bend the *Side-twigs* in the *Joints* towards the great *Branches*, and tie them together with *Bass* or *Packthread*, as in the Fig. (*B. B.*) and being thus tied, they must dress them with *Mummy*, as has been already directed. This I have done in two different manners; for some *Twigs* I daub'd with the *Mummy*, by means of a little Brush, only near the *Ligature*, and here and there upon the *Joints*, but others I dipped entirely into the *Mummy*. The *Branches* being thus prepar'd, they are planted in this manner: You may make a deep Hole, in which you set the *Branches* the reverse way, so as that only the long End of the *Branch* (*I. K.*) appears above the Ground; the rest are cover'd with good, fat and well sifted Earth, and thus the Operation is finish'd. Hereupon the little *Branches* take *Root* every where in their *Joints*, according to (*G.*); then the *Buds* begin to shoot, so as that we may see fifty, sixty, or more *Branches* spring up, making that agreeable and monstrous Figure represented by (*H.*) They who have a mind to make use of this way for all sorts of Figures of Pyramids, &c. may take Directions from this Proposition.

P L A T E XXXI.

A strange and unheard-of Manner of raising monstrous Trees by the reverse Flexure of the Joints, and tying and dressing with Mummy.

(*A.*) Represents a Branch of an Apple-tree, which has abundance of long, slender, and flexible Twigs; it is cut off
 Qq at

at the great End, and held the reverse way in order to be bent.

(B. B. B. B.) *All sorts of such Branches, the little ones bent quite back to the Stock, and tied with Bafs, and fo regularly the lefs to the greater, as appears by the Figure.*

(C. C.) *Represent a like Branch, and how it is bent and dipped in the Mummy, the End at top being alfo cover'd with it; and how you need only rub over some Branches a little with a Brush.*

(D.) *A Tub of Water to cool the Branches when dress'd with the Mummy.*

(E.) *The Copper-kettle upon a Trivet, in which the Mummy is melted.*

(F.) *Represents the necessary Utensils, viz. a Brush, Knives, Bafs, or Packthread, and a little Wood for the Fire.*

(G.) *How the Roots shoot out of the Joints, after having been some time in the Ground.*

(H) *Shews such a monstrous Branch, which has taken Root, and shot out on all sides a number of young Branches, which gives hope of a very singular and new Production.*

(I. I. I.) *May serve to encourage those who are willing to make quick-set Hedges, by means of these monstrous Branches.*

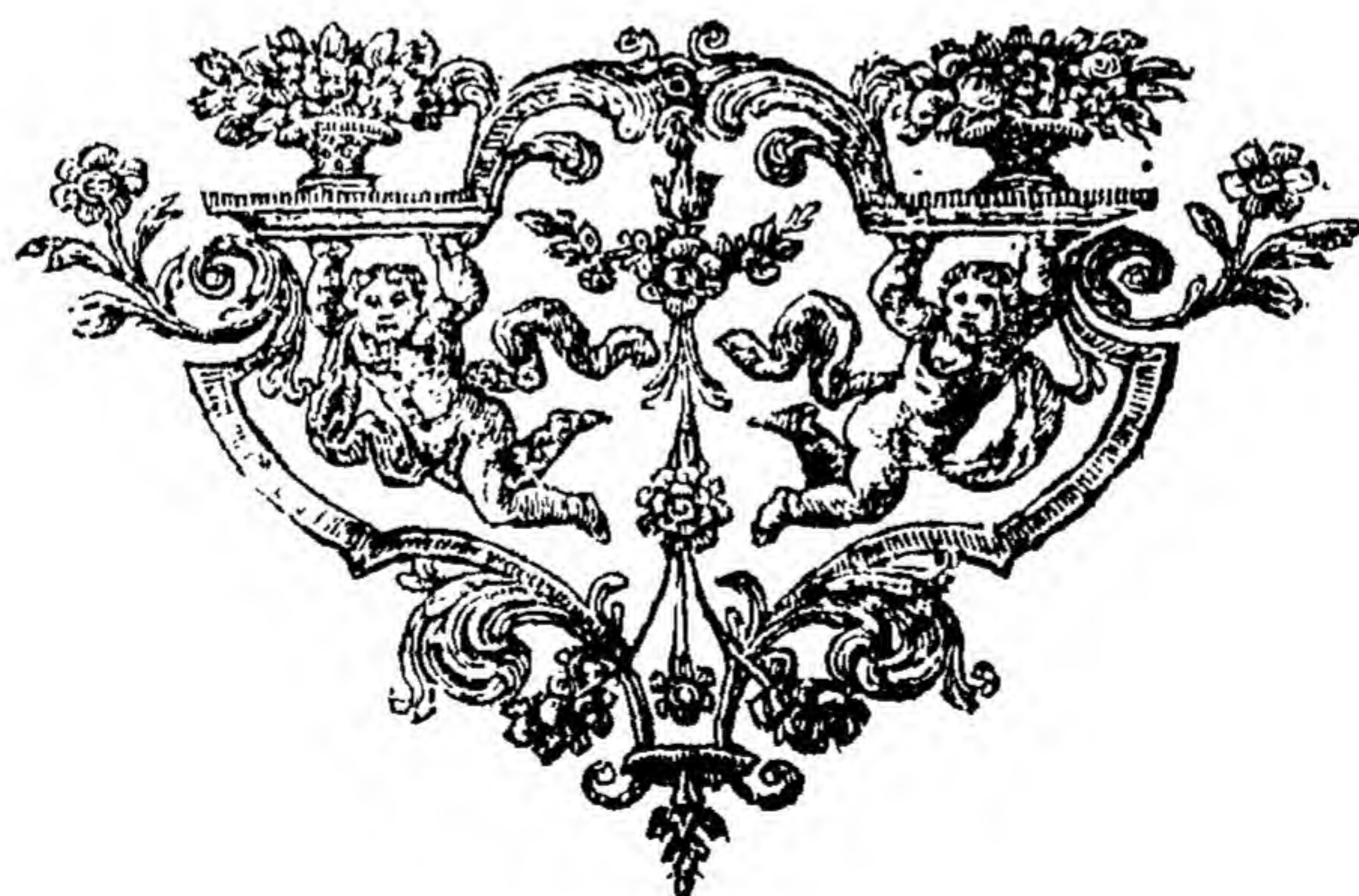


C H A P. II. and Last.

Being an Answer to the Question, How long time the Author requires to perfect all that he has promised, and to inform the World of his Discoveries.

I Have no great Reason, I confess, to propose this Question publickly, being at Liberty to undertake this, or to let it alone, at my Pleasure: Besides, what I do for my own Satisfaction, will be of little use to others; and it were better every Man should put a Hand to the Work, and make his own Experiments; but particular Care ought always to be taken, that, in case he should fail of the expected Success, the Author might not be blam'd as giving wrong Directions; for in such Operations there must be a due Regard had to the Season, to the Weather, to the Soil, and to the Manner of doing the thing it self. Above all, there must be Caution us'd as to the *Mummy*, that it be not laid on too hot. Suppose too that the Undertaker fails the first and second times of Success, he ought not to reject the thing, but proceed to a third Tryal, and examine where the Fault lies, that he may remedy it; which being discover'd, he cannot miss. But it has been objected to me, that I can't produce any number of Proof, for what I have propos'd. This is in some Respects true, in others not. It is true that I have been convinced of the Possibility of all the Operations I have described, have admitted several Friends to be Witnesses of my Experiments, and have sent Specimens to several Places for the Satisfaction of the Curious. It is also true, that hitherto I have not been able to make some other Proofs of them, because I have not had time either to employ my self in the Work, or to instruct others. And tho' sometimes I had Proofs to shew, yet at other times I had none; the whole

depending on the Weather and Season. But having now resolved to give my Pen some Rest this Year, and to employ my self in the Confirmation of my Propositions by Experiments, I only wish for Room to put my Projects in Execution. I want indeed a large Space for a *Wood*, and Ground for *Orchards* and *Vineyards*, and chiefly Money to furnish my other Expences; but if supply'd, I would undertake, within a Twelve-month, to make appear, that many good and useful Things might be executed, conformably to the Propositions I have made. But I leave the Enquiry into these Things to the Curious, begging them to give these Essays a favourable Reception, and shall neglect nothing in order to demonstrate by Experiments what I have hitherto advanced only as a Theory or System founded on Nature and Reason. And in the third Part, which shall follow in due time, I promise sincerely to acquaint the Publick with what Nature shall perform in all those Respects. In the mean time, I believe I have said enough for the present, and so conclude my Work.



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